ELECTRICAL SOUTH

AUGUST
1943

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55th SEASON

52-In Hotel Type

24-In "Airspread" Ceiling

HUNTER, who has made fans and ventilators exclusively during 55 years, is now operating under War Production Board restrictions. • No more fans will be made except for the Army, Navy and Maritime Commission. • HUNTER unfilled orders now on hand represent contracts with Government Agencies. • Certain sizes of belted exhaust types can be made available for Government hospitals and other war industries, subject to limited material inventories now on hand.

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. . . we found Graybar had 'em on file"

(another example of the time-saving gains of Graybar MM Service*)

A firm that was "up to its neck" in war production was confronted with a new questionnaire from Washington concerning the amounts of strategic materials it required. Many of the essential electrical supplies used by this firm were partly or wholly made of these materials.

The compilation job looked overwhelming to the firm's overworked office staff. Then, someone pointed out that virtually all the electrical items were being purchased "via GRAYBAR." Perhaps GRAYBAR'S records could help.

Sure enough, GRAYBAR'S records of shipment and files of product information were so set up that it was possible to assemble the required data right in GRAYBAR'S local office. So far as electrical supplies were concerned, the job was done quickly and accurately, in strict accordance with governmental regulations.

This is only one example of GRAYBAR'S ability and willingness to work with you to smooth out matters of record-keeping and red tape when you buy electrical supplies. If your procurement procedure is necessarily complicated, we'll fill out every form "to the letter." But if a chance exists to help *cut down* on paper-work we'll try just as hard to help you find it.

*** Serving as your MATERIALS MOBILIZER**

By this GRAYBAR service, your electrical needs are linked to the available output of 200 manufacturers, mobilized locally at more than 80 warehouses. The MM Plan "dovetails" GRAYBAR'S procurement work with your own purchasing requirements. You save time in getting estimates, checking specifications, expediting delivery, locating "hard-to-get" items. Ask your local GRAYBAR Representative how this "one-call" service can help you.

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IN OVER 80 PRINCIPAL CITIES

"GraybaR" Everything Electrical . . . . THAT IT TAKES TO WIN!

WAR STAMPS

Will Put You Back in the APPLIANCE BUSINESS

with the APPLIANCE RESTORATION PLAN

ENTHUSIASTICALLY SUPPORTED BY THE WAR SAVINGS STAFF OF THE U. S. TREASURY DEPARTMENT.

SAVE TO SAVE AMERICA—BUY MORE WAR BONDS AND STAMPS

Opportunity knocks! This is your chance to help your country, your fellow-citizens and yourself.

American homemakers desperately need electrical appliances—to replace appliances beyond repair, to provide appliances for new family units, to lighten the burden upon war-workers who must through necessity do their own housework, and to replace human labor diverted into essential industries. Great as the need is it's no secret that no new electrical appliances can be made. But the situation is far from hopeless.

VAST STOCK PILE OF USABLE APPLIANCES WAITING TO BE RESTORED TO SERVICE

In the last 15 years, 179,054,292 small electrical appliances, including 50,848,648 irons, have been sold. These figures show there must be thousands of these appliances lying *idle*—in attics, in cellars, forgotten shelves or drawers. *The pertinent point is that most of these out-of-use appliances are repairable. They must be rooted out, restored to serviceable condition and put in the hands of millions of women who desperately need them.*

HERE'S HOW TO DO IT

1. Buy these restorable out-of-service appliances.
2. Pay for them with WAR STAMPS.
3. Restore them to usable condition.
4. Re-sell them to those who need them.

EVERYBODY BENEFITS FROM THIS PLAN

Original owners of appliances get War Stamps and help others; purchasers get appliances they need and could not buy otherwise; service stations or departments get paid for repairs; dealers get a selling profit; utilities perform a noteworthy, patriotic service; Uncle Sam sells War Stamps; distributors build up future purchasing power for appliances.

Developed by the Proctor Electric Company and presented as a contribution to America's War Effort

START NOW—COMPLETE DETAILS READY

Utility company executives and electrical leagues are urged to write for complete details immediately.

PREPARE YOUR OWN INDIVIDUAL CAMPAIGN with the help of the Appliance Restoration Plan Book and "Action Check List" which explain what this plan is, what it will do, and how you can put it to work immediately.

ADVERTISING IDEAS—Sample layouts to help you prepare advertisements that will pied-piper thousands of these idle appliances from their hiding places.

DISPLAY IDEAS—A suggested compelling window streamer that will stop passers-by and pull owners of idle appliances into your store for the details.

STAMP BOOK ENVELOPE—A simple way to earmark the War Stamps as the first down-payment for the purchase of that after-the-war iron or toaster.

RESALE TAG—A suggested attractive resale tag which certifies that the appliance was bought from its owner with War Stamps and that it has been restored to satisfactory, usable condition.

APPLIANCE RESTORATION PLAN

PROCTOR ELECTRICAL APPLIANCES

PROCTOR ELECTRIC COMPANY, Div. Proctor & Schwartz, Inc., Philadelphia

UTILITY and ELECTRIC LEAGUE EXECUTIVES

ASK YOUR SECRETARY TO FILL OUT AND MAIL THIS COUPON TODAY

PROCTOR ELECTRIC COMPANY
Div. Proctor and Schwartz, Inc.
Third Street and Hunting Park Avenue
Philadelphia, Pa.

Please send me at once complete information about the Appliance Restoration Plan and your suggestions for our participation in this nation-wide appliance sharing movement.

Name of Utility or Electric League .....

Name .....

Title .....

Address .....

City ..... State .....

War Time is Priceless!

ORDER ACCESSORIES WHEN YOU ORDER CABLES AND AVOID WIRING DELAYS

EVEN before the war, the common practice of waiting to order cable accessories until the cable for the job had been shipped frequently caused days of delay.

Today, however, it may even take a month or more before an accessories order can be approved and materials started on their way.

This holds up the wiring job unnecessarily. In the meantime, workers may be idle—and not just electricians alone, for other workers all along the line may be affected. Today, if never before, follow this wartime-saving practice:

1. Order accessories and cable at the same time —for delivery together.
2. When ordering unit package jointing material, include your order for terminals and potheads. If buried cables, remember joint boxes. 43232

Every Anaconda unit package contains instructions and all materials required for the particular job. When ordering, please specify number of unit packages needed, operating voltage, size, number and shape of conductors, thickness and kind of insulation, thickness of lead sheath of cable.

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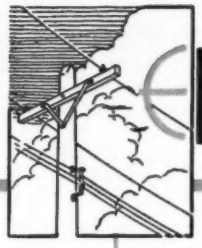
CHICAGO OFFICE: 20 North Wacker Drive • Sales Offices in Principal Cities

Subsidiary of Anaconda Copper Mining Company

AUGUST, 1943

Volume 23 No. 8



ELECTRICAL SOUTH

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Each SWITCHBOARD

is an individual *problem*

The one you need may be different from any other. It depends on the job it will be required to do.

Future expansion must also be taken into consideration when planning the switchboard. It should be so designed as to permit of modernization (should improvements in design and functioning be made), and increase of capacity when needed.

(FA) Live Face Switchboards are available when desired, or when conditions require them. The *trend is to safety* in electrical equipment, however, and (FA) Safety Type Switchboards are rapidly replacing Live Face equipment. These include both switch and fuse and circuit breaker construction.

(FA) SHUTLBRAK

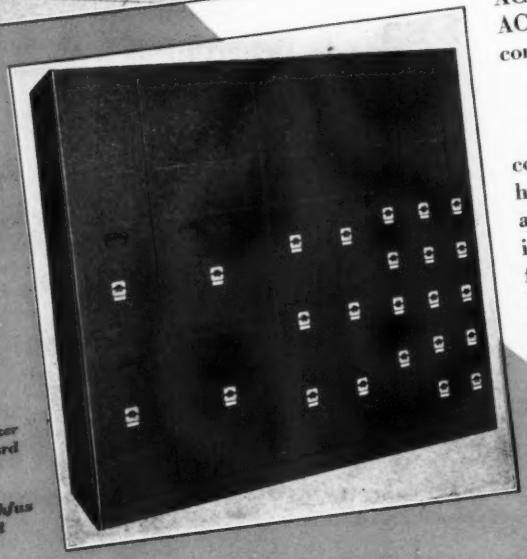
(FA) Shutlbrak Switch units are built in capacities of 30 to 1200 amperes, inclusive, for 250 volts AC or DC, and 575 volts AC, in 2, 3 and 4 poles. Approved by Underwriters' Laboratories, Inc.

(FA) CIRCUIT BREAKER

(FA) Circuit Breaker Type breakers are 2 or 3 pole thermal type. Maximum capacities are 600 amperes, 250 volts AC or DC, and 575 volts AC. For larger capacities, air or oil circuit breakers are used. Approved by Underwriters' Laboratories, Inc.

(FA) KLAMPSWITCHFUZ

(FA) Klampswitchfuz units are made in capacities from 30 to 1800 amperes, inclusive, 250 volts AC and DC; also 30 to 600 amperes, inclusive, 575 volts AC, in 2, 3 and 4 pole types, single and double throw. They are approved by Underwriters' Laboratories, Inc., as operating switches in capacities of 600 amperes and less, 250 volts AC and DC, and 200 amperes or less, 575 volts AC. All other capacities are approved as disconnect switches only.



At top: (FA) *Shutlbrak Switchboard*

At center: (FA) *Circuit Breaker Type Switchboard*

At bottom: (FA) *Klampswitchfuz Switchboard*

For the latest Engineering Data on (FA) Switchboards

consult an (FA) Sales-Engineer. By long experience, he is competent to help Architects, Engineers and Specification Writers in problems of designing and specifying electrical installations. Write for name and address of the one nearest you. No obligation. . . . . Frank Adam Electric Company, St. Louis, Mo.

EST. 1891 — THE SIGN OF A BETTER JOB

Frank (FA) Adam

ELECTRICAL PRODUCTS for War Industry

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

"Up-Rate" Old Transformers By These Practical Methods

By R. L. Brown*

A LARGE part of our great army of power transformers is working only two shifts in their war production jobs! Many of them are capable of doing a much bigger job if a few changes or additions are made to bring out their latent capacities. There are many ways in which this can be accomplished, the method used depending upon the particular case. The following paragraphs describe some of the practical methods of "up-rating" old transformers.

Application of air blast to the radiator surface of self-cooled transformers. Depending on the size of the transformer, this will increase the load which can be carried 25 to 33 per cent, without exceeding the usual temperature limits. Air blast may be applied by attaching a fan and housing to each individual radiator, or, where radiators are mounted side by side in banks, the fans may be arranged to blow through each group of radiators horizontally. Where tubes or tubular radiators are used, fans are arranged at the bottom of the tubes or radiators to blow up vertically over the tubes.

Portable Fans Can Be Used

Where the fans cannot be attached to the radiators, portable fans which are self supporting may be used, which can be arranged around the transformer so that an air blast is directed up over the radiators.

Any of these methods are easily applied and require no modification of the transformer except a tapped hole in the cover; this hole accomodates the temperature device for automatically controlling the fans by oil temperature. However, the current carrying capacity of the bushings and tap changers should be checked at the air blast rating.

Most self-cooled transformers, designed in recent years, have provision for the addition of air blast fans and control equipment without any modification of the transformer or tank. Figure 1 shows a typical application of fans to a self-cooled transformer.

Added cooling by means of external air blast coolers. In some cases, the addition of air blast on radiators may not give sufficient

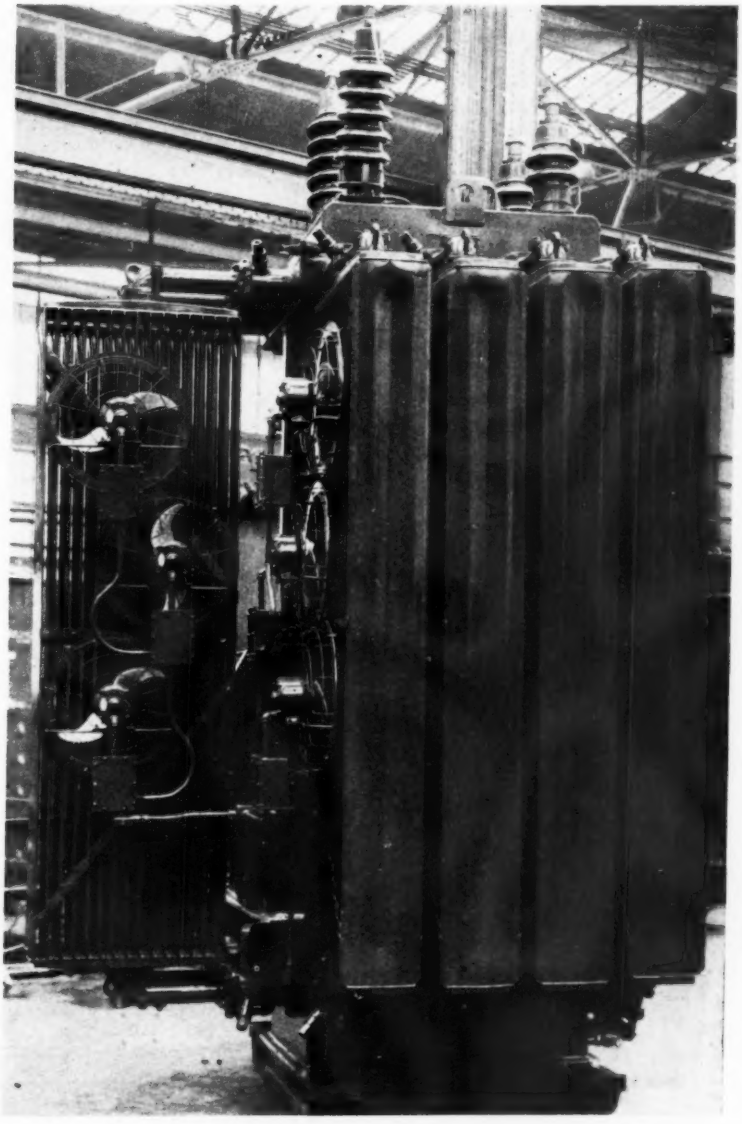
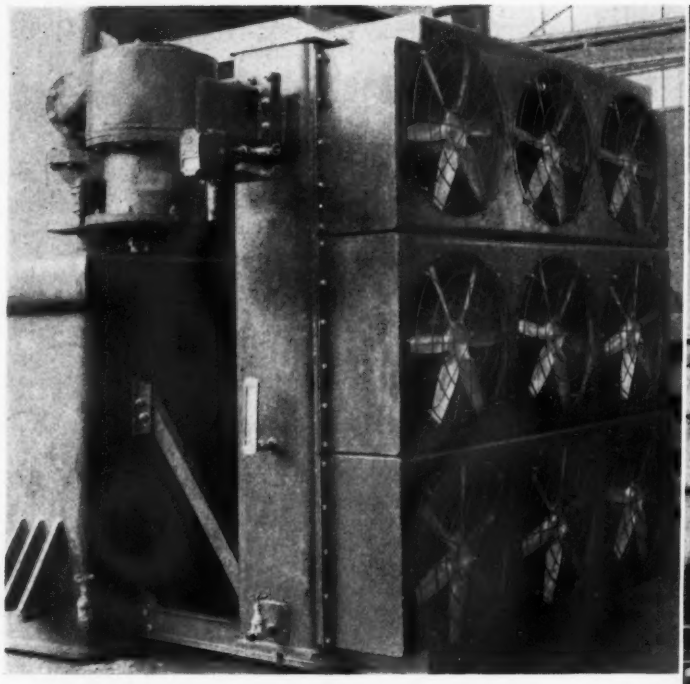


Fig. 1. Self-cooled air-blast transformers rated 10500 kva, 50 cycle, single phase when using air blast. Self-cooled rating, 8600 kva. Fans are controlled by a thermostat in the oil which turns them on and off as required.

*Mr. Brown is transformer engineer for Westinghouse Electric and Manufacturing Company, Sharon, Penna.



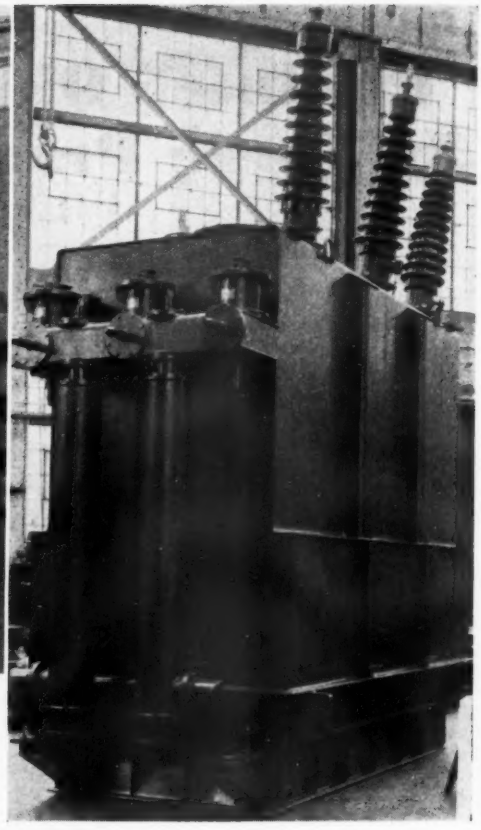


Fig. 2. (Above) Forced-circulation, air-cooled unit. Oil is pumped through tubes having external spiral fans. Air is drawn over the tubes and fins by multiple fans.

Fig. 3. (Right) Forced-circulation water-cooled unit. Transformer rated 37500 kva, has water circulated through tubes in the cooler. Oil is pumped over the outside of the tubes.

capacity or there may be reasons why it cannot be used. Cases may also arise where it is necessary to change water-cooled units to self-cooled units; in such instances an external self-contained radiator with oil pump and fans often works very well. These units may be mounted on the transformer tank or they may be mounted separately. For units up to about 5000 kva, it will be more economical to supply one unit for a bank of three transformers.

When applied to self-cooled units or to water-cooled units designed in recent years, the rating can be increased from 150 per cent to 166 per cent of the rating. The ratings of older units cannot usually be increased so much. Each case should be investigated for losses, reactances, temperature gradients and any limitations of tap changers, bushings, and so forth, before determining the maximum overload rating.

These cooler units consist of a tubular radiator with spiral fins to increase the air surface. This arrangement utilizes an oil pump driven by a motor which is cooled by transformer oil circulated through the windings; the pump is completely sealed to prevent oil leaks. Several small fans are used for blowing air over the radiator tubes. This type of cooler should be controlled automatically since the radiator will dissipate very little heat without the fans and pump running.

On large units where two coolers are used, automatic control can be used on the second cooler. The transformer will usually carry about 70 per cent load with only one cooler operating. Figure 2 shows this type of radiator.

Added cooling by means of external heat exchangers. Where water is available, a heat exchanger may be used in the same manner as the fin type cooler just described. The oil pump used is the same as described for the fin type cooler. No fans are required. This scheme may best be applied to water-cooled units, either to supplement the present cooling coils or to replace the cooling coil. The increase in capacity which can be obtained is the same as for air-blast coolers and the same features of the design should be checked before applying the cooler. Figure 3 shows a heat exchanger used for this type of cooling.

Remodeling the transformer. Increasing the heat dissipation of the transformer may not alone meet the present requirements. It may be necessary to tear the transformer down to change the voltage and to increase the insulation strength; a complete new winding can often be supplied at a fraction of the cost of a new unit.

The following example illustrates what can be done in uprating existing transformers. An industrial plant was served by a step-down bank consisting of three single-phase units and a spare. The transformers were three winding, stepping down from 66 kv to 6900 and 2300 volts. The capacity of the high voltage winding was 12000 kva; the 6900 volt winding, 9000 kva; and the 2300 volt winding, 3000 kva. The 2300 volt load had increased until this winding was overloaded and it became necessary to purchase larger units or rebuild the present ones.

An investigation of the design

(Continued on page 64)

Activities in Every Field Help Contractor to Survive

By Robert A. Latimer

THOUGH many electrical contractors, since the beginning of the war, have attempted to pick out one aspect of their business and specialize in it for the duration, it's actually better to scatter a lot of interests and work at all of them, according to Noble Crump, head of Dixie Electric Company, Montgomery, Alabama.

Mr. Crump's experience has been unique. Though many of his lines are subject to the materials and manufacturing shortages which hit other men, he has actually shown a better income and more volume than before the war. The reasons, he explains, are wrapped up in good buying, promotion, and anticipating trends before they materialize. "Plenty of lines are always a bulwark against loss," he smiled, "And it gives the dealer a chance to shift emphasis from one thing to another, close out this or that specialty, and continually have something to sell."

Dixie Electric Company, a modern combination of showrooms and contracting offices near downtown Montgomery, reflects that conviction at first sight. Lines which stand out are contracting, both commercial and domestic, lighting fixtures, complete service, a surprisingly complete line of major electric appliances, house wiring work, commercial fluorescent lighting, small appliances, and electrical parts. Before the war clouds became dark, Mr. Crump sensed a bit of the future, and bought a three-to-four year stock in every line—including a warehouse full of major appliances which is still active stock, though not expected to last more than a few months.

"For one year I bought everything possible," Mr. Crump grinned," I don't want to appear to be a hoarder, but I did want to protect my business." Retail sales (which are only a small part of Dixie Electric's total business) jumped 100% and have stayed at that mark ever since, even with appliance freezes and other limitations.

Most important increase, however, has been in general electrical contracting, which Mr. Crump foresaw as the biggest job of the war period, and prepared for carefully. Prior to Pearl Harbor, Dixie handled a lot of smaller commercial work, including outdoor garden lighting, amusement parks, etc., and even operated a small neon-sign business. These went by the board immediately with the U. S. entry into the conflict—and Mr. Crump built up an extensive sub-contracting and direct contract business now amounting to 300% more than a year ago.

Contracting under present difficulties have involved a strategic balancing of personnel, materials and solicitation. Ninety per cent of it is direct government installation on a large scale which Mr. Crump believes he would not have tackled under ordinary peacetime circumstances.

"We're extended now to cover the four states of Georgia, Alabama, Mississippi and Florida," he explained, "which we'd never consider doing otherwise. I have found that by making a real study of Air Force airfields and the peculiarities of their electrical work, we can handle much bigger jobs, get first call on them, and make each a stepping stone to another."

In the space of a little more than one year he has supervised the wiring of between 2000 and 2500 Army buildings, ranging from barracks to hangars and airplane sub-depot plants, and many other government buildings and installations. Practically all of these are subcontracts.

"It was either go into direct defense work or fold up our contracting department," he indicated. "Like other dealers, I was worried about the potential losses and risks attached, but found that these are mostly mental obstacles, and that if the shop works with a reliable contractor who has confidence in him, it's simply a matter of getting good work out fast." Mr. Crump works closely with his contractors, keeps them advised of materials in stock, and energetically bids on everything he is confident can be handled.

There is a crew ranging from 25 to 100 electricians employed at all times, some of them working on several jobs at once. When Dixie Electric recently wired 100 cadet barracks at flying fields in the Southeast Training Center area, he had two supervisors rushing from job to job, making corrections and inspections to handle them all simultaneously. A school building, control tower, ground lighting and airport indicators followed these

(Continued on page 61)

There is still some merchandise on the Dixie Electric Co. display floor.

Intensive Salvage Programs Urged Upon Utility Companies

By H. M. MacDougal*

BECAUSE of the absolute necessity of conservation of critical materials, scrap and salvage have taken on a new significance. Scrap, instead of being a nuisance has become a national treasure, something to be sought out—collected—and returned to production channels. *Scrap sources are mines above the ground and must be disgorged of every particle of strategic material they contain.*

Copper, with its alloys brass and bronze, is the number one critical material this year. It is now estimated that all known sources of copper production, and of copper, brass and bronze scrap will not produce enough of the critical metal to supply our war and essential civilian requirements as long as the war lasts. However, we cannot relax our vigilance on iron and steel scrap, nor on non-ferrous metals other than copper and its alloys.

As Chief of the Public Utility Unit of the Industrial Salvage Branch, I am very proud of the splendid job you have done and are doing in producing essential scrap materials. Your accomplishments are all the more significant when we consider that construction projects have been very nearly completely curtailed for you for many months.

Because the so-called "free" materials and equipment have for the most part been moved, we now have a job of digging for the dormant scrap.

Dormant scrap is defined as obsolete machinery, equipment, materials in stock, dies, molds, jigs, fixtures, etc., which are incapable of current or immediate future use in the war production effort because they are broken, worn-out, irreparable, dismantled or in need of unavailable parts necessary to practical re-employment.

Some sources of scrap which you should seek and observe closely are:

(1) Old buildings, stations, warehouses, and gas holders.

(2) Unusable or obsolete equipment, including (a) prime movers and auxiliaries, (b) boilers, stokers, mills, superheaters, economizers, airheaters, (c) pumps and drives, (d) condensers and auxiliaries, (e) extraction heaters, (f) compressors, (g) old stacks, flues, ducts, and tanks, (h) rotary converters, motor generator sets, and motors, (i) pumping stations, (j) meters and instruments.

(3) Dead cable in ducts.

(4) Unusable copper wire.

(5) Idle and unusable transformers built prior to 1929.

(6) Unusable buses, transfer buses and the like

(7) Unusable steel cable

(8) Unusable main and branch pipe lines.

(9) Miscellaneous obsolete or unusable spare parts and equipment.

Reviewing what we have asked you to do; we are asking each company to:

(1) Appoint a top salvage executive with full authority to make decisions and act for his company.

(2) Organize a salvage committee to include pertinent department heads.

(3) The committee should: (a) survey all plants and properties for untapped sources of dormant scrap, (b) prepare a complete listing of all unusable or obsolete equipment, (c) arrange immediately to dispose of all listed items which are unquestionably dormant scrap, (d) study all other listed items to determine whether they should be scrapped.

(4) Questionable items should be presumed free and available unless otherwise determined.

We appreciate that you are doing exactly these things, but the one thing that seems to be most commonly lacking in executing a

*Mr. MacDougal is chief of Public Utilities Unit, Industrial Salvage Branch, Salvage Division, War Production Board, Washington, D. C.

BIG PUSH CALLS FOR STEEL

Scrap faster . . .

Win sooner!

With Axis morale sinking faster under every bombing . . . with the fortress of Europe cracking ahead of schedule . . . we're setting up the Axis for the final hay-maker!

That means an advance behind a curtain of shrieking steel . . . continuous barrages blasting our enemies round-the-clock until they say Uncle!

The Time Is Now

So our war planners have flashed an urgent message *to keep the steel coming.* And remember, half of the huge production will be scrap. Will we make it? Of course we will!

We'll make it because every ton, pound and ounce of that steel scrap now so urgently needed will help to shorten the war by just that many days, hours and minutes!

We'll make it because that means saving the lives of so many dear to us who are out there somewhere today, getting set for the big push.

Be Wise—Organize!

So *organize* your scrap drive . . . make it a continuous operation . . . in charge of a square-jawed executive with authority to keep it rolling! And segregate your steel types, wherever possible, according to alloys and grades. It will save tie all along the line . . . get your steel into the fight faster!

No matter how many times you have looked . . . look again . . . and *keep right on looking!* For only then will the furnaces be able to push capacity to the limit . . .

BUSINESS PRESS INDUSTRIAL SCRAP COMMITTEE

Room 1310, 50 Rockefeller Plaza, N.Y.C.

SEND FOR PRIMER OF INDUSTRIAL SCRAP TO HELP YOU TACKLE THE SALVAGE PROBLEM.

If you have done a successful salvage job at your plant, send details and pictures to this magazine.

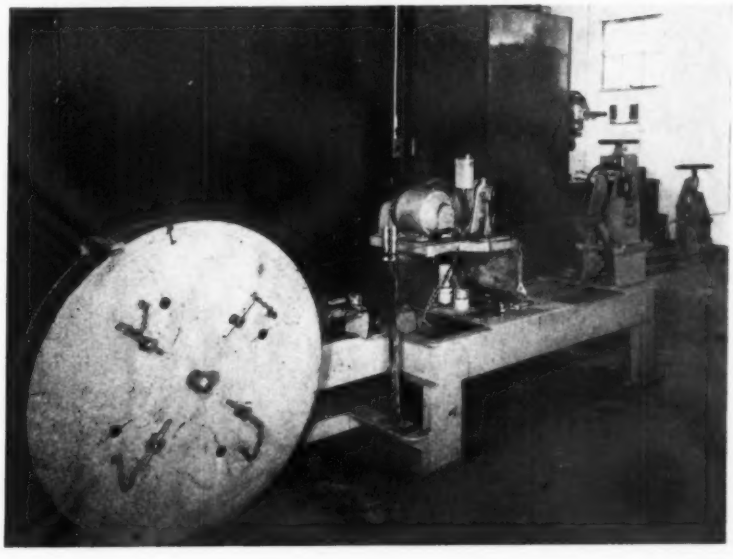
salvage program throughout your plants and systems, is the lack of initiative in acting on certain items of materials. We realize that the reason for this is a sincere intention on your part to cooperate completely with the various agencies in Washington which are interested in your operations.

We are and have been cooperating in our public utility salvage work with the Power Division and the Communications Division of the Office of War Utilities to accomplish the maximum in material problems common to us. As you know, the War Production Board has decentralized nationally into twelve regions. This procedure is directed to the end that its functions and services can be operated more closely to the problems. Policies, plans and programs prepared in Washington are to be activated and executed in the regions.

The regional organization of the Power Division, which is closest to your problems and mine, is the Regional Utility Inventory Control Department. The function of this regional office is to assist in re-distribution of excess materials, as provided in War Production Board utilities order U-1, to promote the maximum use of materials for the benefit of the war program. Having participated in it, you will recognize that under this order, gas, electric and water utilities are required to sell surplus stocks of materials to other utilities needing them. Except in emergency cases, utilities in need of certain materials valued in excess of $100 must contact the WPB Utility Inventory Control Department for data as to the availability of items from excess stocks in inventory files.

I frequently encounter the condition where a public utility representative of Industrial Salvage, in contacting the salvage execu-

(*Continued on page 60*)



Typical of salvage operations conducted by one southern utility company is the scene shown at the top where supervisors examine every item of pole line hardware, insulators, etc., for reuse, reclamation, or salvage as scrap. The machine shown in the center photograph strips wire for salvage. The machine shown below combines the functions of splicing short lengths of insulated wire for reuse and the stripping of wire with worn out insulation for salvage as copper scrap.

Maintenance in a Dairy

Although the basic principles of electrical maintenance are the same for any particular piece of equipment, there are many industries which present specific service problems. This is one of a series of articles discussing such problems.

FOREHANDED planning in the selection of its electrical installations and equipment now enables the Home Milk Producers Association, of Miami, Florida, to process its available raw milk supply on a daily 'round-the-clock basis with minimum maintenance and, to date, no serious work-interruption.

About two years ago, the Association, a South Florida milk producers' cooperative which has been in operation since 1928, decided that its rapidly expanding business needed larger and improved processing facilities. As the result of this decision, Home Milk constructed a new building, and equipped it with up-to-the-minute processing machinery.

Located at Northwest Seventh Avenue and 24th Street, the Association's present plant is one of the largest and most modern of its kind in the entire South. The main structure, garage and parking yard take up practically all of a city block.

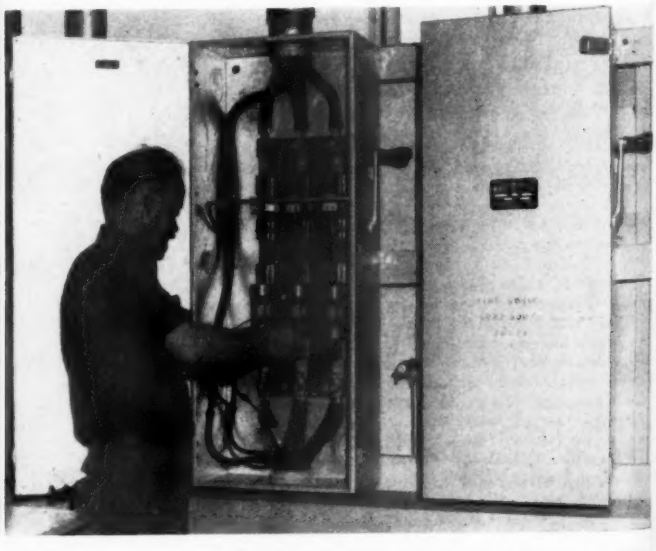
Except for Mazda lamps to illuminate receiving and loading platforms and a 50 ft. by 80 ft. milk cooling room, the plant building is lighted throughout by open-type fluorescent fixtures, equipped with two 40-watt lamps each.

Offices and a retail store for the sale of milk products are air-conditioned. The equipment for this purpose is of home manufacture, and consists of two coil-units, taken from the cooling room at the dairy's former plant, and two fans driven by 1/6 hp electric motors. Water from an ice manufacturing machine, flowing through the coils at 33° F., serves as a refrigerant.

All processing and manufacturing operations throughout the plant are electrically operated. Electric current motivates ice and ice-making equipment and refrigeration units. It operates bottle washing, bottle filling and packaging machinery. It powers conveyor systems, milk separators and pasteurizers. It drives agitators employed for a number of uses.

For these and a wide variety of other purposes the dairy has in use approximately 70 electric motors ranging from a fraction to 75 horsepower.

Some machinery installations are individually powered by a single motor. Other apparatus requires more than one motor. For instance, the bottle washer and the pack-ice machine have three motors each with total ratings of 12 hp and 7 hp.



Left, O. T. Johnson, plant superintendent of the Home Milk Producers Association, Miami, checks fuses in a unit type 'safety" power panel. The safety features offered by this type of panel construction have a special appeal in a plant where moisture, and even water, usually is present. At right is one of the 600-ampere, quick-break, safety type main switches. These switches are grouped at a readily accessible location where they may be pulled instantly if an emergency, such as an enemy air raid, should arise.

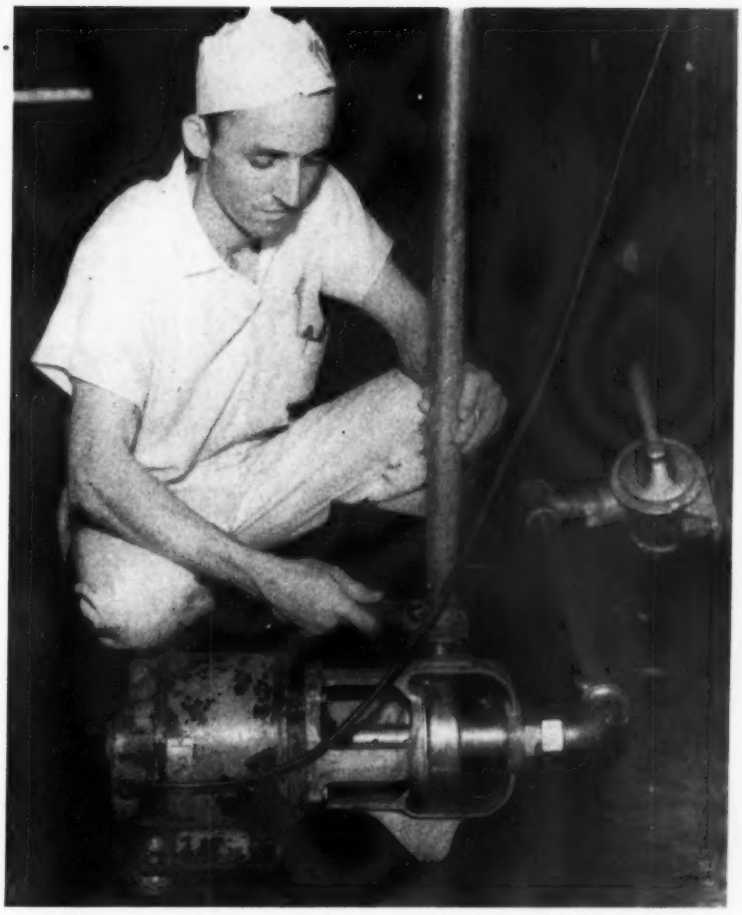
"When the Association first started to plan the construction and equipment of its new building," explains O. T. Johnson, Home Milk's plant superintendent, "the nation already was knee-deep in its defense effort. Even then, materials and manpower shortages had begun to develop.

"Therefore, in our planning we realized the necessity for choosing electrical equipment which would provide a maximum of safe and trouble-free operation, and at the same time would require minimum upkeep effort and replacements.

"In striving toward these objectives, we were extremely fortunate in regard to the cooperation and technical assistance we received from equipment and materials suppliers, the local utility and our electrical contractor. We feel especially indebted to N. W. Upson, of Graybar, and A. O. Wickham, Florida Power and Light Company power consultant for technical advice and to Stewart Electric Company, Miami, for the excellence of its work."

The current furnished by the utility is 4400/2300-volt, Y-connected, 3-phase, 4-wire. This is stepped down to 115/230 volts by three pole-mounted, lightning-arrestor-equipped, 75 kva transformers. Owned by the dairy, these transformers offer a decided advantage in the establishment of a rate-base.

Main switches are of 3-pole, quick-break, safety type and are of 600-ampere load capacity. In three groups, metal enclosed and located in the compressor room at the rear of the plant, these switches may be pulled instantly, if an "emergency," such as an enemy air raid, should arise.



The dairy has several motor and pump combinations intended as "standbys" for use in case regular installations fail to function. T. J. Smith, plant foreman, connects one of these units into a "milk line." The standbys are mounted on roller equipped metal platforms and may be moved quickly to any part of the plant. Proper selection of equipment and good maintenance has made it unnecessary to use any of these spares since the new plant was put into operation.

Multi-Breaker Panels Used

Throughout the plant there are nine 50-ampere, multi-breaker type light-distribution panels, having from 8 to 16 circuits each.

Power distribution in the various production portions of the building is handled by three special "safety" panels. Main lugs at the panel, which supplies current to the milk-processing equipment, are 400-ampere, 3-phase, 3-wire. The panel itself has fifteen branch circuits, thirteen of which are fused for 30 amperes, and the other two for 60 amperes.

The bottle-washing room panel, having twelve individual circuits, and that for the boiler room with six branches, are of 200-ampere capacity. Branch circuits are fused for 30 amperes.

This type of panel is made up of separate units, each of which has its switch blades mounted on a hinged metal door, opened and closed by a cam-action handle. When the door is opened, the circuit is broken.

The blades themselves, attached to fiber mountings, also are hinged and may be jack-knifed flat against the unit door. Of course, when the blade-mounting is swung aside, the circuit is "dead," and remains so until the blades are restored to their original position. The accidental shutting of the panel-casing door, while current is supposed to be cut off, will close the unit door but does not close the circuit. Since the unit is completely "dead" when its door is open fuses may be changed with the bare fingers.

Paul Marton, the dairy's general manager, expresses himself as particularly well pleased with these safety-panel installations. The danger-free features offered by this type of panel construction, he points out, has a special appeal in a plant where moisture—and, in some parts of the building, water—usually is present.

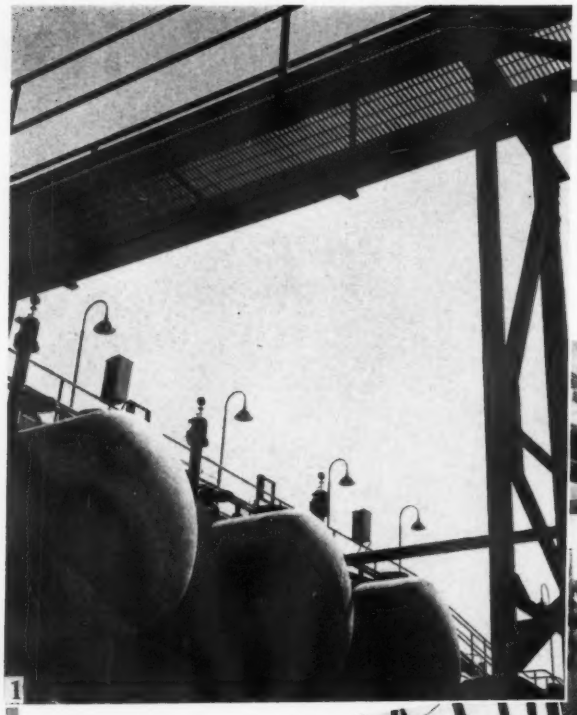
Feed wires supplying current to processing apparatus are carried in exposed two-inch conduit which also serves to support the "milk lines"—piping through which the milk flows from one piece of equipment to another.

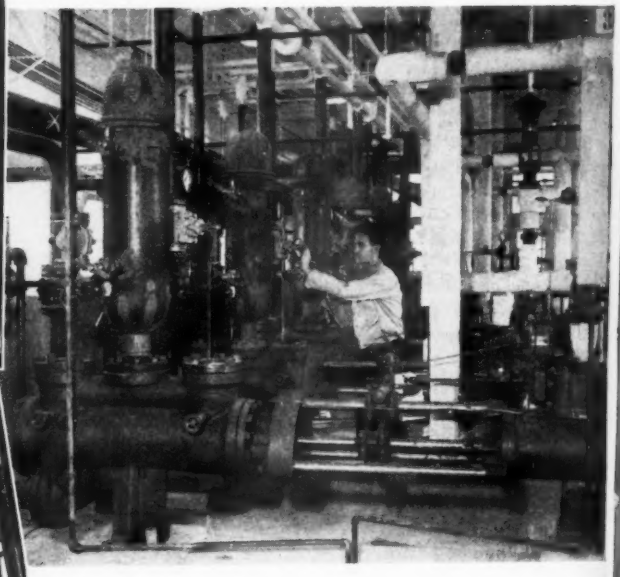
Motor starting-switches in almost all instances are provided

(*Continued on page 58*)

Synthetic Rubber

THE FIRST of the Government's large synthetic rubber plants, complete at one location, is rapidly coming into full production. Located at Institute, West Virginia, the plant will produce, at full capacity, the equivalent of one-sixth of the country's normal peacetime requirements. At full capacity, the plant will produce 90,000 long tons of Buna S rubber annually. The plant is operated for the government by the United States Rubber Company.



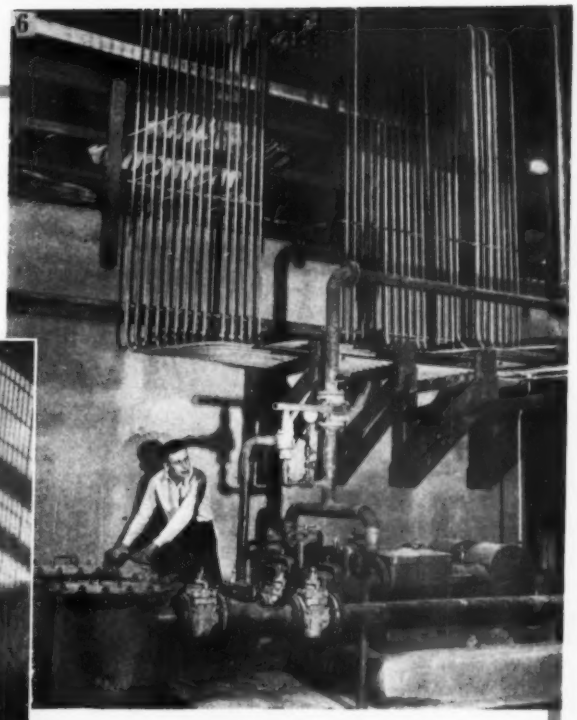


(3) The raw materials, butadiene and styrene as well as many special chemicals, are moved by pumps and pipe lines from their storage tanks to the reactor areas. (4) The actual making of the synthetic rubber is called polymerization and takes place in large glass-lined vessels called reactors. There are a total of 72 such reactors in the Institute Plant.

These photographs show some of the various steps in the manufacturing process. (1) Three of the twelve 30,000-gallon tanks for storage of butadiene and styrene. (2) Purification of the butadiene takes place in this complicated chemical apparatus.

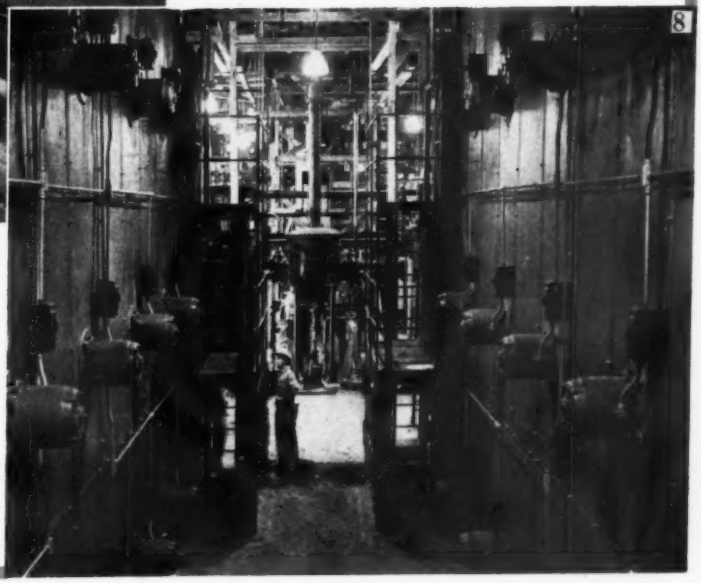
In West Virginia

The Institute Plant is divided into two principal sections. In the chemical plant, the two principal constituents of Buna S are produced. These two materials, butadiene and styrene, in liquid form, are piped from the chemical plant to the adjacent rubber manufacturing plant. Advantages of Buna S over other synthetics are: it more nearly resembles rubber; can be worked on ordinary rubber machinery; and raw materials are readily available.



(5) When polymerization has reached the proper point, the batch is blown down by butadiene pressure to the blow-down tanks in which the reaction is arrested. The unreacted butadiene and styrene are then recovered.

(6) Many batches of synthetic rubber latex are batched and blended in twelve 30,000-gallon concrete storage tanks. This blending assures uniformity of the product. The rubber content of the synthetic rubber latex is then coagulated and separated in the form of flocs or crumbs.



(7) After certain dilute chemicals have been recovered, the synthetic rubber in the form of crumbs is washed and excess water is removed.

(8) The Buna S synthetic rubber is then dried by passing back and forth three times in 12 enormous driers. At full operation, these driers will evaporate 160 tons of water per day. The rubber is formed into loaves and packed in cartons to protect the loaves and to avoid loss in shipment.

Southern Motor Repair Shops Keep War Plants Operating

By Geo. H. Watson

KEEPING WAR plants operating so far as their electrical wiring and motors are concerned has taken just about 100 per cent of the time during the past two years of the Birmingham Armature-Electric Company, Birmingham, Alabama. This has required 24-hours-a-day service and twice during that time the concern has found it necessary to take on additional space. Recently, the concern moved into its new home just a stone's throw from Birmingham's civic center at Woodrow Wilson Park.

In broadening out its service in the face of a manpower shortage, the concern has found it necessary to employ girls as motor rewinders, also to use older men and physically handicapped men in the shop. School boys have also been used to some extent.

"We are determined to carry on somehow, despite the handicaps which may arise, and we expect the manpower problem to become more acute," said E. J. Fairley, proprietor, who went to Birmingham in 1914 from Mobile and for the past 20 years has operated his own business in the city. He reports that the girl workers catch on to the work quickly and are able to do a neat job of rewinding the smaller motors.

Mr. Fairley cites a few instances where his concern has served war plants in emergencies. There was the case of a machine shop making 105 mm. shells. A big rain left its power house standing in 29 inches of water. Mr. Fairley and his organization pulled out the motors, cleaned them up, ran them through a baking oven and got most of the plant back in operation in two days and all of it in four days.

There was another case in which an important industrial plant was left stranded when the 350 hp Corliss engine supplying it with power ran away, bursted the flywheel, and tore up the main drive. Mr. Fairley was called in on the job. While he assembled and installed enough motors to make up the 350 hp, the Birmingham Electric Company, local utility, hurriedly installed a 13,000 volt substation. The two organizations had the plant back in operation in four days, using central station power.

Still another instance is given by Mr. Fairley where a big factory had a fire which burned off the roof and damaged important installations. He was called on the job late at night. He got in touch with the union and rounded up every available electrician in the city. With this help, he had the machine shop back in operation within one day and a half. He personally stayed with the job until it was finished.

Recently Mr. Fairley had a call where a rat crawling over a 2200-volt switch, which operated a 225 hp air compressor motor, threw the plant out of operation. He quickly restored service and about the only casualty was the rodent.

"It seems that most of our calls are urgent in their nature," commented Mr. Fairley. "When we are wanted, we are wanted! That is the same way it is with a doctor, and perhaps that is a tribute to the service an electrical contractor renders."

This concern has been called, recently, on several important war plant rewiring jobs. Here again, the call is of an emergency nature. A plant which has expanded and has taken on big war contracts

(Continued on page 58)

A view of the rewinding shop of Birmingham Armature-Electric Co.

Taxes--A Year-Round Problem

By Arthur Roberts

UP TO NOW, the electrical contractor has considered his income tax only around filing time but because the current rates are the stiffest in history and destined to go higher, making tax a major expense, it is necessary to consider this impost throughout the year the same as other costs.

When the rates were lower, tax expense did not influence operations to a great extent. The contractor figured his net profit at the end of the year, sometimes a few days before March 15. Today, the same practice may bring the sheriff because this tax touches every element of business operation, sales, credits, collections, working capital, budgeting, turnover, costs, etc. Consequently, the contractor who expects to survive the duration and be ready for the big profit possibilities that should materialize in the post-war period must analyze every phase of operation throughout the year in relation to the Federal levy on income.

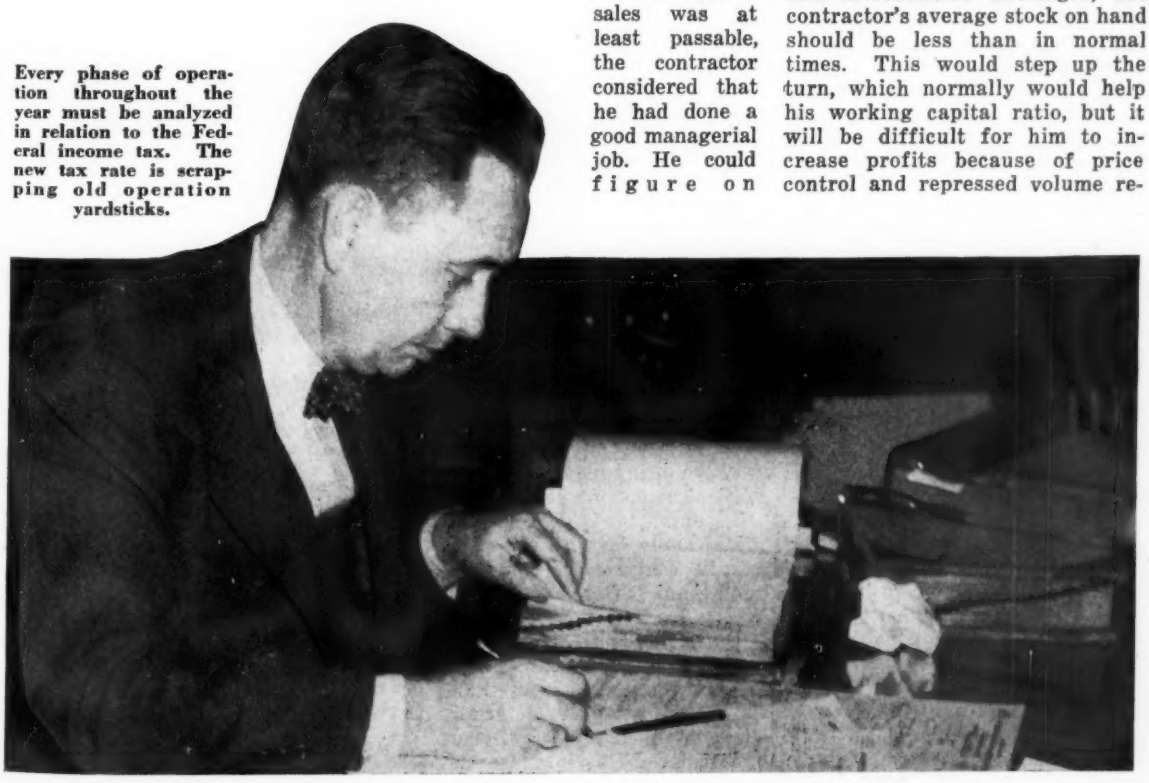
Many contractors do not realize that the high tax rate is scrapping old yardsticks, changing ratios that were once considered normal and complicating managerial procedure. These provisions must be given careful thought, otherwise, the result may be disastrous. If the contractor does not give more consideration to income tax expense, not just as a tax payment, but in regard to its effect on operations, he may find it difficult to do business at a profit even though all his operating elements are what normally would be considered satisfactory.

Formerly, the yardstick of managerial efficiency was reflected in the net profit and then the Federal tax deducted. The net profit was the thing. If it showed a satisfactory return on investment and the ratio to sales was at least passable, the contractor considered that he had done a good managerial job. He could figure on crediting a substantial part of the net profit to surplus or net worth because the tax of former years took only a modest portion.

Now, it cuts so deeply into earnings that he can no longer place as much reliance in the net profit as a yardstick of efficiency because, after the income tax is deducted, the net will be substantially reduced. "Taxable profit" would be the better term for the difference between sales and overall costs. The net profit is really what is left after the Federal tax is deducted.

And even if the contractor has a satisfactory portion left after deduction of income taxes, he may not have the funds to pay unless he increases his working capital by turning stock faster, cutting expenses, increasing profits, discounting his bills, collecting his accounts more promptly or going on a strictly cash basis.

Because of limited inventories and merchandise shortages, the contractor's average stock on hand should be less than in normal times. This would step up the turn, which normally would help his working capital ratio, but it will be difficult for him to increase profits because of price control and repressed volume re-



Every phase of operation throughout the year must be analyzed in relation to the Federal income tax. The new tax rate is scrapping old operation yardsticks.

sulting from the inability to get the goods to sell and this will counteract the effect of a higher turn.

If his variable expenses are a high ratio to fixed, he may be able to reduce overhead somewhat. The accounts receivable offer the best opportunity to improve his cash position. Some merchants are eliminating credit entirely. Customers will pay cash for goods and service today because they have the money and merchandise and manpower is scarce. High receivables indicate gross laxity and a dangerous condition. Terms on open account should not exceed 30 days.

When the tax was low, a contractor may have been able to let collections run longer than wise practice conceded desirable because he had ample funds, he was unharried by a high tax lien, or his suppliers carried him for a time, but his suppliers now will face the same problem of meeting a high tax bill promptly and must therefore get their collections in faster than before so the contractor will have to put pressure on his credit customers, too. A wheel within a wheel. The income tax will be high for years to come and will compel the business man to revise his working capital ratios in order to have sufficient liquid funds to pay Uncle Sam on the nose.

The net profit on the profit and loss statement does not indicate the liquid funds to meet obligations. We have found cases where the net was substantial but the working capital way below par. In normal times, an electrical contractor's working capital was considered satisfactory when the current ratio was 2 to 1. Now it should be 3 to 1, at least. The electrical dealer should show a current ratio of 4 to 1 or better on the financial statement. The ratio of current assets to current liabilities is called the current ratio.

Sales Volume Affected

Sales volume will also be affected by tax. The rate increases with net taxable income so that those contractors who go just over the borderline to a higher tax level may show a lower spendable profit than those whose volume is near the top of a lower bracket. Obviously, this will distort the basic principle of business—bigger earnings with bigger volume. The way the tax is levied today, you may earn less by increasing volume, even though you sell at profitable prices. This may put a damper on sales aggressiveness and kill the basic force that keeps free enterprise alive.

With war controls and limited civilian goods, sales volume is likely to be depressed for the duration so that this effect of tax will not be noticeable now but when the post-war boom appears, then the contractor had better be sure to check his tax against sales monthly to determine the most profitable set-up.

When budgeting operations for a forthcoming year, it will be necessary to estimate the tax in order to pre-judge how profitable operations will be. In the past, most dealers and contractors entered the tax when paid, quarterly or annually, as a charge against surplus or net worth, because the Federal tax cannot be deducted from income on the tax return. From the income tax standpoint, this was satisfactory because it beclouded perspective.

●

A forthcoming article in Electrical South will discuss a simplified payroll system applicable to motor shops, contractors, and others.

●

Under the new tax plan, the estimating of tax at the beginning of the year will become a "must," hence, the contractor using a budget will not be put to additional calculation. He should use the same figures on the budget that he gives the Government. Every dealer or contractor should have a profit and loss statement prepared monthly and if the income is pro-rated, he will get the proper perspective on operations month-to-month.

Accounting phraseology or theoretical argument notwithstanding, the contractor is concerned, in the final analysis, with the spendable profit because that is what he can bank after the income tax is paid. Hence, he should figure on that objective, no other. If this figure is unsatisfactory, he must work back from there, analyze operations to determine the reason, then apply all possible correctives to increase taxable profit so that he can have enough pocket-profit left after the deduction of income tax to sugar the net worth on the right side.

This procedure will depend on circumstances and they differ with the business, hence, we do not attempt to offer concrete advice or specific suggestions. Our purpose is mainly to impress upon the reader the necessity for revising his viewpoint and method of handling tax expense, giving the main reasons why such revision is necessary.

The foregoing is not one man's opinion. Credit men and commercial authorities are already giving consideration to the changing yardsticks brought about by high taxes and are revising their methods of business analysis. In the future, when granting credit, the credit man will consider the tax that will be paid on business operations, not only around March 15, but throughout the year, prorating the expense per month, a factor that did not inject itself into credit analysis heretofore.

Inasmuch as business specialists are already considering changes that high taxes will superimpose on operating ratios and routine, the contractor should also get in line now because the trend will gain momentum fast and he will benefit by early compliance with the change. When asking for credit from a supplier or a loan from a bank, give thought to your tax liability so that you know whether you are well covered in this regard or can give creditors the needed information. The contractor who shows that he is alive to changing trends brought about by the new economy born of the war and certain to project itself, more or less, into the post-war period, will be considered a better risk for credit. When granting credit to individuals or business concerns in the future, consider the fact that the higher tax that must be paid on income may make a credit-seeker less desirable as a risk than heretofore.

The "Carry-Back" Provisions

The important carry-over, carry-back provisions now in the Internal Revenue Code demand consideration throughout the year in connection with operations. For example, if you had a loss carry-over of $2,400 in 1941, of which only $600 was absorbed in 1942, leaving $1,800 to carry over to

(*Continued on page 56*)

Servicing the Refrigerator

Part 5: Temperature Controls*

THE PRIME function of a refrigeration temperature control is to start the condensing unit motor when the temperature in the space being refrigerated has risen to a predetermined set point, and to stop the unit when the required lower temperature has been reached.

This is accomplished by using what is commonly termed an electrical make-and-break switch and may be compared with the common toggle switch used in turning on or off electric lights.

The only difference being that an ordinary switch is operated manually, whereas in a refrigeration system, the power necessary to operate the switch is furnished by refrigerant gas pressure transmitted through a bellows, connected to a lever which in turn connects or disconnects the switch.

There are two distinct types of temperature controls: first, the so-called low pressure control which operates on, and is directly connected to, the low pressure side of a refrigeration system; and second, the thermostatic type of control.

Referring to the temperature-pressure relationship of refrigerants, one will recall that with a given temperature there is always a corresponding pressure. If a drum of liquid refrigerant (F-12) is placed in a room temperature of 90 degrees, the corresponding pressure will be 99.6 pounds.

The same holds true in a refrigeration system. As the cooling unit picks up heat from the cabinet, the pressure increases in the low side, and as the compressor takes away the heat laden gas, the pressure decreases and the temperature decreases correspondingly. The low pressure control is connected into the low side of the system, usually by a short piece of tubing connected by a tee into the suction line.

Figure 1 illustrates a low pressure control. You will note by studying this illustration that the bellows is contained in a cylindrical extension on the side of the control body. One end of the bellows is held stationary in the bellows container while the other end, to which is soldered a pin, is allowed to expand according to the pressure exerted upon it. As the pressure increases in the low side, the bellows becomes elongated and presses against an arm which in turn operates the switch mechanism, starting the motor.

As the pressure decreases, aided by the pressure exerted by the spring tension on the bellows arm, the bellows contracts allowing the switch mechanism to open the electrical circuit, stopping the motor. As the increase or decrease of pressure is usually slow and as the action of making or breaking an electrical circuit should be rapid, some method must be devised to have the points separate with a "snap" action. All switch manufacturers use some principle of snap action, either a permanent magnet, a roll type toggle device, or a mercury tube.

The reason for the snap action on the switch is to keep the contact points from arcing. All pressure type controls have adjust-

*This article is published through the courtesy of the Nash-Kelvinator Corp.

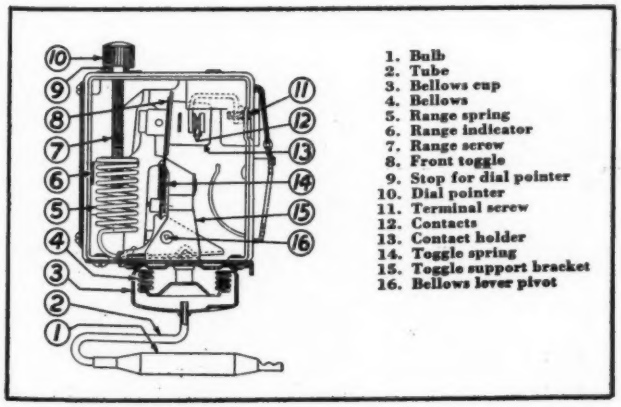


Fig. 1. (Above) Cross section and identification of parts of low pressure type temperature control. As the name indicates, it is connected directly into the low pressure side of the system.

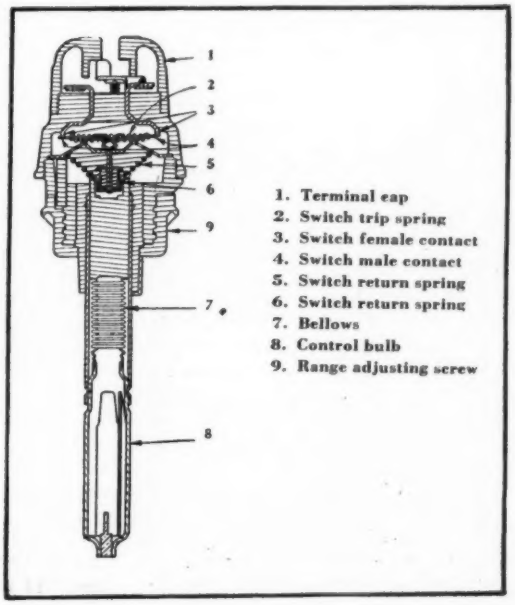


Fig. 2. (Right) A compact form of pressure control showing details of snap action switch.

ments so that cut-in and cut-out points can be adjusted to give the proper setting for the more common refrigerants.

The cut-in point on a control is that setting where the pressure has reached a predetermined point and starts up the unit, and the cut-out is the reverse. It is necessary to have a difference in pressure between the cut-in and cut-out points (commonly called range or differential) in order to obtain satisfactory running time of the unit. The reason for this is to prevent too frequent operation of the motor and also to give sufficient running time to freeze ice cubes.

Thermostatic Controls

The second type of control, and the one in most common use in household cabinets today, is the thermostatic type.

This control has the same functions as the pressure type control. The only difference between the two is that the pressure type is directly connected into the refrigerant system whereas the thermostatic type has a bulb and capillary tube which furnishes the pressure for operating the bellows. The thermostatic type is not connected into the primary refrigeration system.

The bulb of this control, as used on household cabinets, is usually fastened directly to the lowside in such a manner that it has very good thermal contact between the surface of the bulb and the lowside surface.

As the temperature of the low side increases, the temperature of the bulb increases accordingly, thereby causing a pressure in the bulb and capillary line and then in the bellows operating the switch mechanism; causing the switch to cut in. The refrigerant in the control bulb responds to any change of temperature in the low side, thus operating the switch mechanism exactly the same as on a standard pressure control.

On the majority of household controls there are small knobs used for temperature adjustment of the controls. This is usually operated with the pointer on the knob set at normal position, which gives an average cabinet temperature. By turning the knob to the right or left, as indicated, the cabinet temperature can be changed, either warmer or colder. By changing the position of the indicator

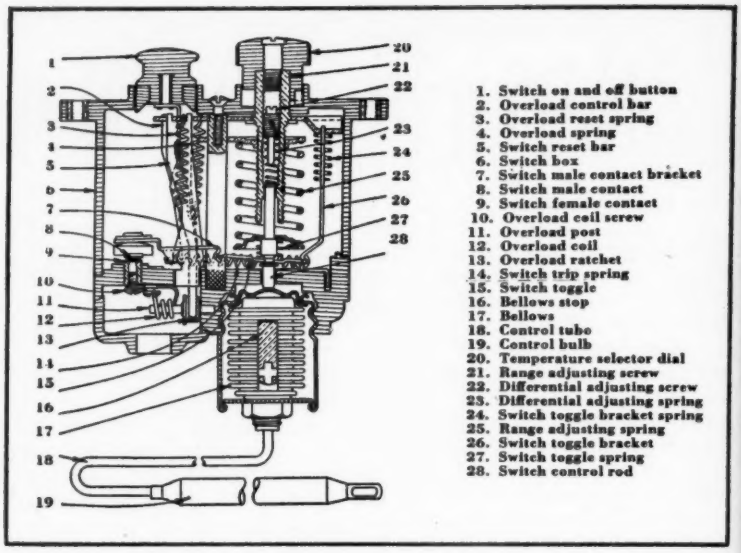


Fig. 3. The thermostatic type of temperature control is used to a very large extent on household type refrigerators. It differs from the pressure type control to the extent that it is not connected directly into the refrigeration system. The bulb which furnishes the pressure for operating the bellows is usually fastened to the low side of the system in such a manner that it has good thermal contact between the low side of the system and the surface of the control bulb.

to a colder position, the whole range of the setting is lowered. The control cuts in lower and cuts out lower. By lowering the cut-out point, a longer "on" cycle of the condensing unit results and the cooling unit and cabinet temperature is lowered. By turning the knob in the opposite direction or to a warmer position, higher cooling unit and cabinet temperatures are obtained.

Temperature Control Service

An inexperienced service man often will condemn the control as the cause of continuous or long running, an inoperative condensing unit, or a cabinet that is too cold or too warm.

Usually, these complaints are due to causes that affect the control operation directly or indirectly but seldom are they found to be caused by improper functioning of the actual control mechanism.

It is difficult to describe control service except in a general way as there are so many different designs of contacts, adjusting points, and special arrangements featured by the various manufacturers. Some controls are non-adjustable; some have sealed cases. The only service that may be performed on these is the replacement of a power element (bellows, capillary tube and bulb assembly) or the replacement of the control complete. With an adjustable type control, the contacts may be inspected or repaired, the differential changed to meet specific conditions, and the power element changed if necessary.

The cleaning of burned, scorched, or corroded contacts is a delicate operation and should be performed carefully. *Never use emery cloth.* Use a very fine grade of sandpaper and do not score the contacts.

If a leak develops at the power element bellows or bulb, the charge will be lost and the bellows or diaphragm will collapse. The contacts will remain open and the control will not cut in. The remedy is to replace the entire power element if it is of the replaceable type, or to return the entire assembly to the manufacturer if it is not.

If a bellows has lost its charge, it may be very easily compressed with the fingers, but if it is charged, compressing the bellows with the fingers is very difficult. You may find an occasional replaceable type bellows case that is not screwed tightly in place. This will establish an entirely different temperature range than the range for which the control was originally set.

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The control power element bulb (or tube) must have exceptionally good contact with the cooling unit (at the suction line connection when operating with an expansion valve; usually on the side of the cooling unit, near the top or header with a flat or capillary tube system.) If a bulb is loosely clamped, the result may be long or continuous running time.

A loose electrical connection at the control may cause erratic operation or an inoperative unit. When checking for the cause of an inoperative unit, be sure to determine whether or not the control is equipped with an overload device, fusible metal link, or some other form of safety device. Many controls are made with some form of protective cut-out. This is usually indicated on the control face by a reset button or transparent section that shows red when cut-out from overload. Some controls have heater coils through which the current passes. In the event of an overloaded condition, the solder connection releases a ratchet at a predetermined heat and effects the cut-out. These heater coils are of different ratings depending upon the motor capacity. Always be certain that the proper size is installed. Other type motors are fused at the motor junction box, usually with an ordinary screw-type house fuse.

Trouble from Overcharge

An overcharge of refrigerant in the system may cause conditions which, without due consideration, could be attributed to an imperfect control. "Normal refrigeration with excessive running time" is a complaint often construed as control trouble. If a service man installs his gauges when first arriving on the job, he will find that possibly the cause of trouble is due to an overcharge. If this is the case, the head, or condenser pressure will be higher than normal (as shown in condenser-pressure relation tables). The upper portion of the condenser will be hot and the lower portion will be at approximately room temperature. The remedy is to purge off sufficient refrigerant to bring the pressure to normal.

An under charge of refrigerant can create the same symptoms (corrections to be described in a later article) and there are many things that may appear to be control trouble that a thorough check will prove to be caused by an entirely different source. The foregoing example is presented to illustrate the fact that a control, because it is responsible for starting and stopping the motor and maintaining proper temperatures, is not necessarily the major cause of refrigeration complaints.

Defrosting Arrangements

Manufacturers of the first temperature controls made no provision for the defrosting operation. It was necessary to remove the service cord from the wall plug receptacle, stopping the motor until defrosting was accomplished.

The next step toward a defrosting control was an "ON" and "OFF" switch, built as an integral part of the control itself. This was not a great advance, but it was an added convenience, however, as it permitted the user to break the electrical circuit without removing the wall cord.

A later type control is the "Automatic Defrosting" control. When defrosting is necessary, the user simply sets the defrosting switch or button and when defrosting is accomplished, the switch or button returns to normal operation automatically.

The control most generally used today has a defrosting setting that is simply a range adjustment. The user sets the indicator at "Defrost" and the unit operates just enough to keep the refrigerator cool; permitting the frost to melt. The indicator must be returned to the normal operating position manually.

There are many variations of these specific types in use; some late models have a clock arrangement that automatically defrosts the cooling unit once every 24 hours. Some are semiautomatic; others are entirely manual.

Range and Differential

The range of a control is the spread (number of units of pressure or temperature), between the lowest cut-in and the highest cut-out points obtainable. This does not mean that a setting of these two widely separated points can be obtained. The range is not the operating setting.

The differential setting of a control is the difference between the cut-in and cut-out points. The maximum differential is the widest setting that can be obtained between the cut-in and cut-out points. The differential is the operating setting.

For example, assume a pressure control with a range of 40 pounds cut-in and 10 inches cut-out. Its maximum differential may be 20 pounds; in other words, there will be a maximum of 20 pounds difference between the cut-in point and cut-out point any where between 40 pounds and 10 inches. If conditions required a 25 pound cut-in, the maximum cut-out point would be five pounds. This differential is not fixed on most controls and may be narrowed somewhat.

Most controls operate as outlined in the foregoing paragraphs. There are many variations, however, and before any adjustments are attempted, it is well to study each case individually and the manufacturers specifications.

Temperature Control Characteristics

Thermostatic controls and pressure controls are quite similar both in operation and results obtained. Thermostatic controls are actuated by a refrigerant gas within a bulb or tube which is affected by the temperature of the suction line at the cooling unit or by the temperature of the cooling unit proper. Pressure controls are actuated by the gas pressure of the actual refrigerant gas within the low pressure side of the system. When pressure increases the temperature rises; when the temperature drops, pressure decreases. Refrigerant temperatures and pressures are closely correlated.

A pressure control cannot be readily adapted to a system using an automatic expansion valve. The automatic expansion valve is set to maintain a constant pressure on the low side of the system while the compressor is in operation, while a pressure control operates on a pressure differential. For this reason, a pressure control is not practical and a thermostatic control must be used.

Thermostatic controls are used on all sealed unit systems, the control operating indirectly to start the motor. When the cooling unit reaches the cut-in temperature, the thermostat contacts close and complete an electrical circuit through the starting contacts of a relay. The current passes to a starting winding of the motor, shifted out of phase with the running winding, thereby starting rotation of the armature. As the motor speed increases, a prede-

termined condition is reached where the running winding current warms the thermal relay starting element sufficiently to open the starting winding contacts, thereby taking the starting winding out of the circuit. The motor then operates on the running winding alone.

The season for using a relay to start the motor is that most sealed unit motors run as single phase induction motors; this type of motor is not self-starting and needs a starting winding in the circuit at the beginning for this purpose. Generally, either a thermal or a magnetic relay is used to take the starting winding out of the circuit.

Altitude Correction

One of the operating forces in temperature and pressure controls is atmospheric pressure. Since atmospheric pressure is less at higher altitudes, this lessened pressure results in a lower than normal temperature in the system unless the settings of the controls are changed. Consequently, to compensate for altitudes, the recommended settings of pressure or temperature controls must be raised. Recommended settings are usually figured at sea level but when altitudes are appreciably higher than this, 1" or ½ lb. pressure or 8/10 degrees temperature should be added for each 1,000 feet above sea level.

As an example of this, if the recommended setting is 8" vacuum, then for an altitude of 3,000 feet the control setting should be 5" vacuum. If the recommended setting is cut-in at 26-28 degrees and cut-out at 16-18 degrees, then the compensated setting at an altitude of 4,500 feet is cut-in at 29.6-31.6 degrees and cut-out at 19.6-21.6 degrees.

Installation and Removal

When installing or removing a low-pressure control or high-pressure cut-out, the work should be carried out in a manner that will prevent loss of refrigerant and also prevent air, moisture, and dirt from entering the system. Proper use of the service valves that are a part of the condensing unit make it possible to easily install or remove these controls.

Removing a Low-Pressure Control. Before removing a low-pressure control, back out the compressor suction service valve, remove the pipe plug, assemble a compound gauge and turn in the service valve about one-half turn. See whether the suction pressure is above or below 0 pounds. If it is above 0, turn in the service valve and run the motor until the pressure drops to 0. On F-12 or Methyl units, close the discharge and suction service valves and bleed to zero pressure. If it is below, leave the suction service valve open and let the evaporator warm up until the pressure rises to 0; then turn in the service valve. Turn in the compressor discharge service valve (or liquid receiver inlet or oil separator service valve) in order to completely isolate the compressor from the high side of the system. Disconnect the low-pressure control. As soon as the control has been disconnected, plug or cap the control fitting and the control line.

Removing a High-Pressure Cut-Out. Before removing a high-pressure cut-out, turn out the compressor discharge service valve (or liquid receiver inlet or oil separator service valve if there is no compressor discharge service valve), remove the pipe plug and attach a purging line. The purging line must have a valve; this should be closed. Locate the end of the purging line outside the building or in a place where the gas can cause no damage. Turn in the discharge service valve and the suction service valve. Open the purging line valve and allow the refrigerant to discharge from the cylinder head and the high-pressure cut-out bellows. Disconnect the high-pressure cut-out. As soon as the control has been disconnected, cap or plug the control fitting and the control line.

Re-Installing a Low-Pressure Control or High-Pressure Cut-Out. To install a high-pressure cut-out or a low-pressure control on a compressor from which a similar control has just been removed, connect the control to the proper control line but do not tighten. Then crack the proper service valve (discharge service valve for high-pressure cut-out; suction service valve for low-pressure control) and allow a small amount of refrigerant gas to come out at the joint between the control line and the control. Then tighten the joint. This operation will purge any air from the control line. Open both suction service and discharge service valves and test the unit for leaks. The system is now ready for operation and for checking the adjustment of the control.

Installing a New Control to a Charged System. When a high-pressure cut-out or a low-pressure control is to be added to a charged system, the operations to be performed are those just described. Balance the low-side pressure at 0 pounds for a low-pressure control, or purge the compressor head for a high-pressure cut-out, then assemble the control and control line, purge the control line, and test the system for leaks. The fittings and tubing necessary to connect a control are a half-union or half-union elbow and sufficient length of ¼" tubing with a ¼" flare nut on each end. The half-union is assembled into the pipe thread on the compressor head for the high-pressure cut-out, or into the pipe thread on the compressor suction chamber cover for the low-pressure control. The controls should be mounted on a bracket fastened at some convenient location, usually to the condensing unit base.

Installing a Thermostat. Thermostats are easily installed and removed, but certain precautions must be taken. If it is necessary to locate the control where the ambient temperature surrounding the control body will be less than the temperature of the refrigerated space, a control especially designed for this application must be used. When a thermostat bulb is run through the wall of the cooler, the hole must be carefully sealed. When a thermostat bulb is to be mounted against the cooling unit to react to evaporator temperatures, care must be taken to insure good contact between the thermostat bulb and the cooling unit. A poorly clamped bulb will give very erratic temperatures. If a control is installed vertically, the control line should always be on top. If it is desired to have the control react to fixture air temperatures, the control bulb should be located where the air temperature will be an average temperature. Do not locate the bulb in the warm air or cold flues or where it will receive the air blast from a forced convection cooling coil or where it will receive a warm air draft when the fixture door is opened.

If the temperature control reacts to fixture temperature it is desirable to use a control with a

(Continued on page 55)

Streamlined Wartime Meeting Planned for Southern IAEI

CONCENTRATING attention on the electrical inspector's part in the war effort, the fifteenth annual meeting of the Southern Section, International Association of Electrical Inspectors, will be held at the Roosevelt Hotel, New Orleans, September 27, 28 and 29.

One of the principal features of the three-day meeting will be the "Code Panel" discussions scheduled for four of the five half-day sessions. B. Z. Segall, chairman of the General Meeting Committee, reports that the Code Panel discussions will deal with war emergency rules and regulations in particular and will provide an excellent opportunity for the exchange of ideas on meeting wartime problems.

"Many questions will occur, undoubtedly, to every member on this subject. They will be welcomed by the chairman of this committee, F. G. Camus, chief city electrician of Shreveport, La., and should be sent to him before September 10 in order to be included in the program," said Mr. Segall.

At the same time Mr. Segall urged members to make reservations for transportation and hotel accommodations *immediately*. New Orleans is a popular tourist city and today is thronged with war-business visitors, service men and their families, and other visitors. Those planning to attend the meeting should send copies of their reservations to the General Committee, care of Mr. Segall, New Orleans Public Service, Inc. This will facilitate arrangements.

One of the highlights of the meeting will be a visit on Wednesday afternoon, September 29, to the plant of Higgins Industries, Inc. This outstanding war plant, now in mass production on various types of water craft for our Navy, offers an unusually interesting experience and is a rare opportunity for those attending the conference. Ladies in attendance also will be allowed to make this trip. Other arrangements for the ladies include a walking tour through the old French Quarter.

In addition to the Code Panel discussions, the business sessions will include several prepared addresses. These will be brief and ample time will be provided for discussion of essential features.

At the opening session on Monday morning addresses will be made by the president of the International Association, T. W. Bowry, of Richmond, Va., and the president of the Southern Section, Paul L. Muller, of New Orleans.

The Monday afternoon session will include talks by Lieut. Commander John J. Gidiere, U. S. Coast Guard; Victor H. Tousley, secretary-treasurer, IAEI, Chicago; Campbell Palfrey, State Fire Marshall; L. F. Adams, General Electric Co., Schenectady, N. Y.; David B. Lawrence; and Frank E. Rainold, Rockwood Sprinkler Co.

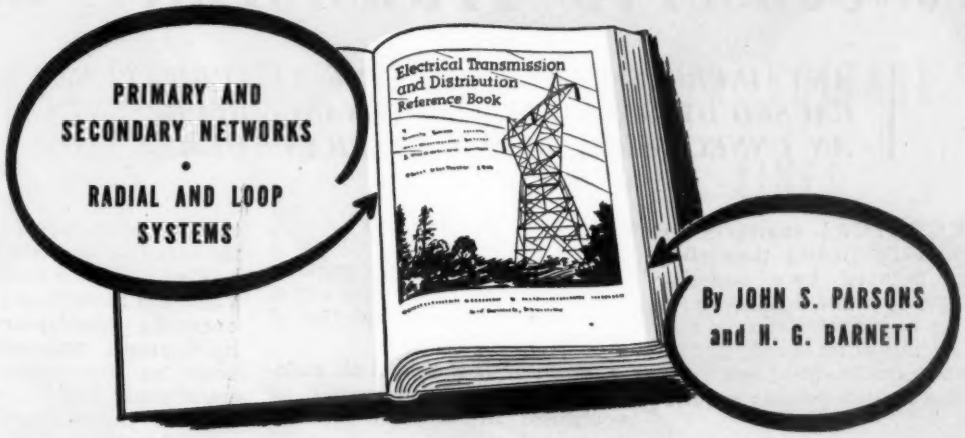
Those scheduled to speak on Tuesday include: M. M. Brandon, Underwriters Laboratories, New York City; Robert J. Kuhn, New Orleans; W. W. Taylor, Equitable Equipment Co.; Milton L. Levy, Higgins Industries; Arthur Naquin; B. P. Caldwell, Underwriters Laboratories, Chicago; and Arthur L. Abbott, Nat'l Electrical Mfgrs. Assn., New York City.

The meeting will be adjourned at noon Wednesday and those interested in the inspection tour through Higgins Industries will assemble directly after adjournment.

Although there will be no formal exhibit, some manufacturers of electrical equipment will have exhibits in private rooms.

The business sessions will start promptly at 9:00 A. M. and 1:30 P. M.

MORE KILOWATTHOURS FOR VICTORY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To Conserve Transformer Life

ANY INCREASE IN OPERATING TEMPERATURE CAUSED BY IMPROPER MAINTENANCE REPRESENTS AN UNNECESSARY WASTE OF TRANSFORMER LIFE

By S. Bennon*

ELECTRICAL engineers are gradually finding themselves caught between two opposing tendencies; on one hand the very pressing demand for more power, and on the other hand the increasing curtailment of new facilities due to high priority requirements.

Under the pressure of these conditions, engineers have found it increasingly necessary to utilize existing facilities to the highest possible degree. Maintenance will have to assume a critical position as a guard against unnecessary deterioration and loss of life. As a vital link between the generating system, the transformer will of necessity bear a major portion of this increased burden.

The basic idea behind all maintenance is the preservation of equipment life. When operated at normal temperature and with the proper maintenance, a transformer will have a long but more or less definite life span. Being a static piece of equipment, it will have a life determined essentially by the life of its insulation.

In this connection, it is important to note that all processes of insulation deterioration are progressively accelerated as the operating temperature is increased. Although it is often expedient to allow temporary overloads and the resulting higher temperatures, as discussed in a recent paper by Vogel and Sloat(1), any increase in operating temperature produced by improper maintenance represents an unnecessary waste of transformer life.

Power transformers are generally oil immersed, the oil acting both as a cooling and insulating medium. When transformers have been properly filled the oil enters all voids and spaces in the solid insulation which is predominantly fibrous in nature. Both the oil and the fibrous insulation are adversely affected by the presence of moisture and oxygen.

The Action of Oxygen

The action of moisture is relatively direct and when present in appreciable quantities it quickly reduces the dielectric strength of both the oil and the fibrous insulation, especially the latter.

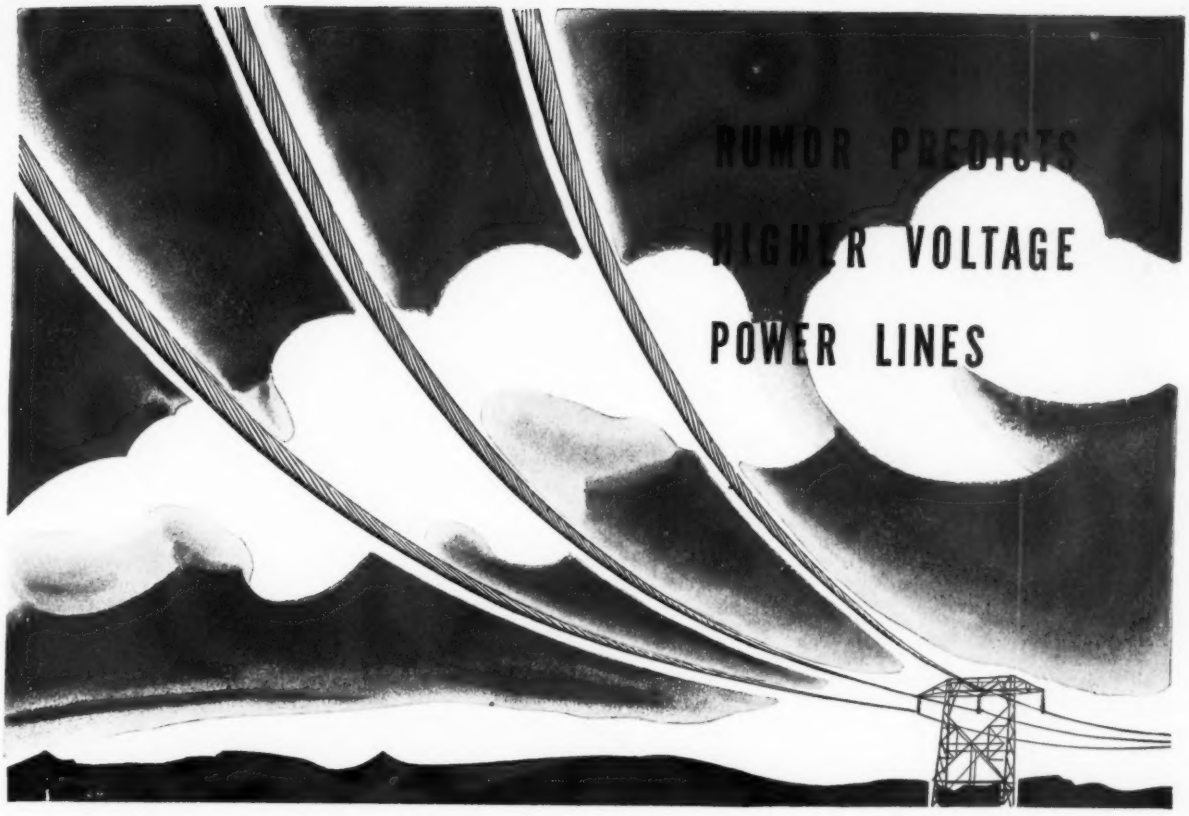
The action of oxygen is less direct. When oil is exposed to oxygen at elevated temperatures a gradual oxidation occurs, with the formation of organic acids and other undesirable products. During this process the oil gradually darkens and becomes clouded, with a progressive loss in dielectric strength. After the process of oxidation has proceeded sufficiently, a dark sludge separates from the oil.

In the case of fibrous insulation the deterioration makes itself evident more as a decrease in mechanical strength than a decrease in dielectric strength, there being a gradual process of embrittlement with progressive darkening. This deterioration process is greatly accelerated in the presence of oxygen and the decomposition products of oil previously mentioned. The process of deterioration of both oil and solid insulation may be greatly retarded and oil sludging prevented by the

*Mr. Bennon is transformer engineer for Westinghouse Electric and Manufacturing Company, Sharon, Penna.

(1) Numbered references are listed at the end of the article.

Fig. 1. Temperature readings for oil transformers should be taken with alcohol thermometers as mercury is an excellent conductor and might cause damage if thermometer is broken inside transformer. Wrenches, screwdrivers, and thermometers should be tied securely to the inspector's belt as tools dropped into the windings and not retrieved might cause a breakdown.



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IMAGINEERING AT WORK

ALCOA A·C·S·R

Fig. 2. Before working on any transformer, make sure that it is de-energized. Remove disconnect switches from secondary side of transformer first, then from primary side. Here, workman is disconnecting switches from primary side of transformer. Secondary side, not shown, has already been opened.

elimination of oxygen normally present in the gas space above the oil.

Transformers now in use employ a variety of schemes for protecting the oil. The simplest is the dehydrating breather; this merely removes the moisture from air entering the gas space but leaves the oxygen to do its damage. The next step is the expansion tank with the dehydrating breather. This reduces the amount and temperature of the oil exposed to the oxygen, but oxidation still progresses at a reduced rate.

Finally there are *Sealedaire* and *Inertaire* transformers, or their equivalents, from which both oxygen and moisture are excluded. With Sealedaire this is accomplished by a completely gas-tight case; with Inertaire an automatically-regulated atmosphere of dry and inert nitrogen is maintained above the transformer oil. With this review of transformer deterioration processes, specific items in practical maintenance methods can be considered.

Oil Level—All power transformers should have an oil level gauge in operating condition at all times, preferably with alarm contact. A regular check of the oil level is essential from both the electrical and thermal point of view.

Electrically, the low oil level may expose live parts designed for operation under oil, thus causing direct electrical failures. Thermally, a low oil level may cause an increase in operating temperature, with an accompanying increase in the rate of insulation deterioration.

In a self-cooled transformer this would result when the oil is below the top radiator opening; thus the oil must heat up until it reaches a level sufficient to produce circulation through the radiator. In a water-cooled transformer it would be caused by low oil level leaving parts of the cooling coil exposed.

Most power transformers are designed to operate within a limited oil temperature range, usually between —5° C and 80° C. If the oil temperature falls much below —5° C, it may be necessary to add oil to bring up the level and then to remove the excess oil when the temperature rises. If the additional breathing is not objectionable, the excess oil may be left in the transformer.

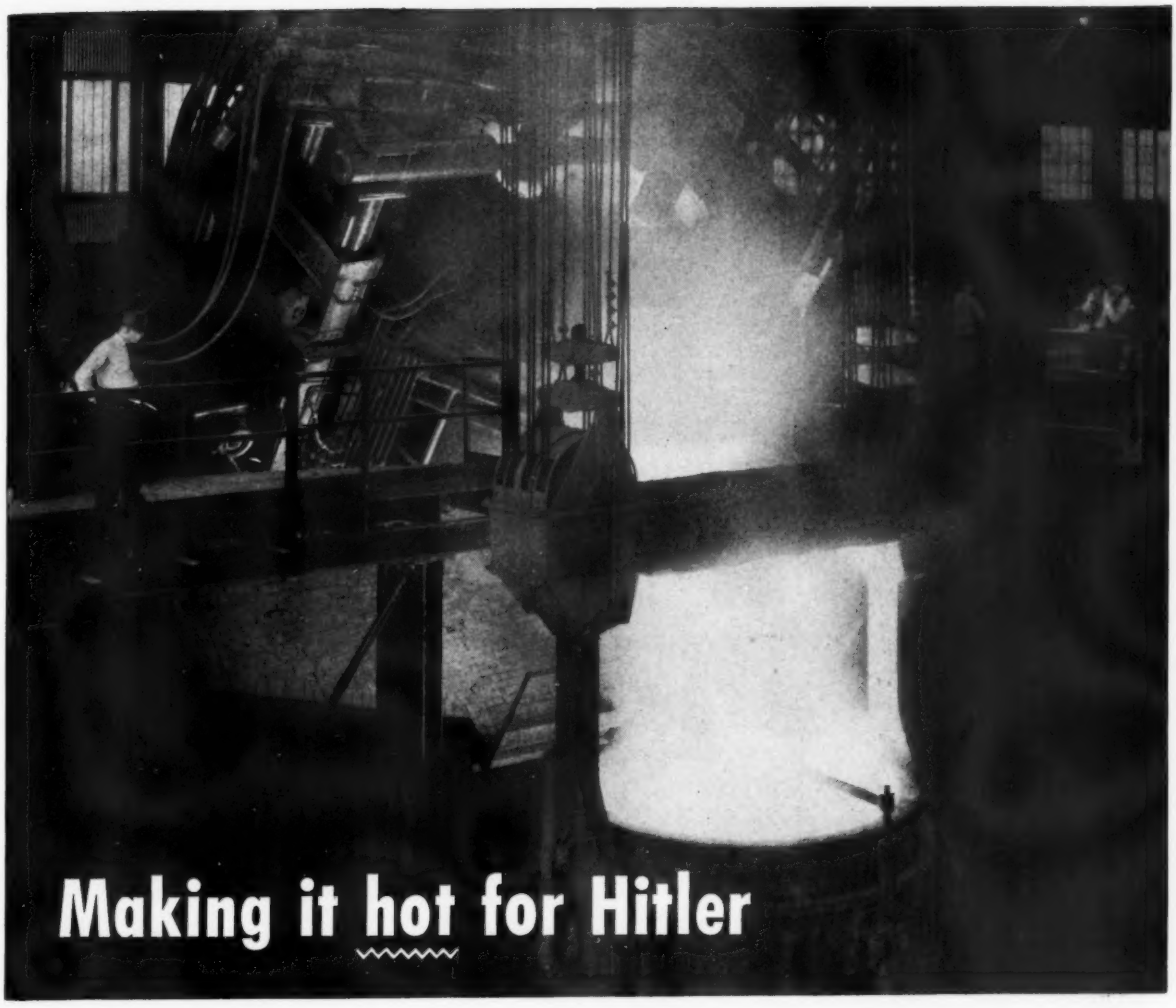
Oil Condition—It is essential that periodic inspection and tests be made so that the oil can be purified or replaced if necessary. The frequency of inspection and testing depends upon the type of service and the oil protection provided. Transformers subjected to heavy overloads must have their oil tested more frequently than transformers subjected to normal loads. Likewise, transformers protected with devices excluding all oxygen and moisture require less frequent oil inspection than those lacking this protection.

It is recommended that operators prepare a schedule for inspection, based on their operating conditions. However, the period between successive inspections should never exceed six months even under the best conditions. When the dielectric strength of the oil drops to 20 kv in the standard oil test cup with 0.1 inch gap, it should be looked upon with suspicion and in no case should it be allowed to drop below 18 kv.

Where facilities for oil tests are not available, samples of the oil may be sent to the transformer manufacturer for test. Convenient sampling bottles are supplied by most manufacturers at a nominal price.

Oil Purification—The three major methods for purifying oil are: by centrifuge, by filter press, and by chemical treatment. The centrifuge is used for removing large amounts of water and solid impurities. The filter press is used to remove small quantities of wa-

Fig. 3. The first thing to check to determine the condition of a transformer is the oil. Oil of normal dryness will test 22 kilovolts or higher in the standard test cup. Here, oil samples drawn from the bottom of the tank are being tested in a portable oil testing outfit. This test should be made at least once a year.



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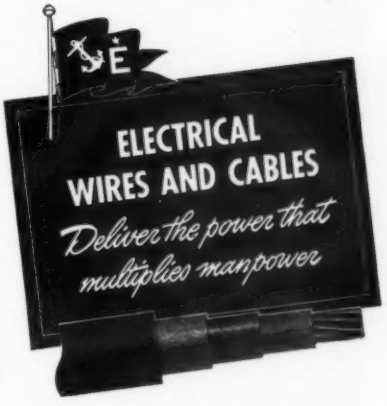

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ter and solid impurities. Chemical treatment is used to remove soluble impurities such as organic acids. For specific information concerning available and recommended purifiers, the transformer manufacturer should be consulted.

Oil Thermometers — Oil thermometers should be read at least once a day and preferably should be equipped with alarm contacts. If, at rated load or less, the oil temperature for a self-cooled or self-cooled air-blast transformer reaches 80° C, or 65° C for a water-cooled transformer, it is advisable to check operating conditions. When test data are available, the oil temperature at normal load should not exceed the ambient temperature plus the oil rise measured on the factory temperature test.

Winding Temperature — Where winding temperature or hot spot temperature indicating equipment is provided, it should be read simultaneously with the oil temperature; there are cases where winding temperature may increase without a corresponding increase in oil temperature. This is true, for example, when there is sludging. However, hot spot indicating devices are set to read approximately 10° C higher than the average full-load self-cooled copper temperature, to allow for the difference between hottest copper and average copper temperature.

When the transformer is operated self-cooled air-blast, the hottest spot allowance is increased to 15° C. The standard limit, as set by NEMA for normal continuous load, is a hottest spot temperature of 95° C. If test data are available, the limit to indicate normal operation would be the sum of the ambient temperature and the average copper rise on factory temperature test plus 10° C or 15° C. It should be pointed out, however, that for higher loads the hot spot devices tend to read too high. This is caused by the arbitrary choice of hot spot allowances of 10° C and 15° C. Actually these figures have been found to be generous as shown in a recent article by Vogel and Narbutovskih[2].

Thermal Relays and Overload Operation—Since the amount of deterioration produced is a function of temperature and its duration, small overloads can be carried for longer periods of time than large overloads. The problem of overloading as related to insulation deterioration is covered thoroughly in a recent article by Vogel and Sloat, referred to previously. The length of time of overload permitted by the thermal relay decreases with increasing overloads and provides full protection as well as full utilization of the transformer. For a treatment of the thermal relay the reader is referred to the article by Putman and Dann[3]. Each thermal relay applied to power transformers is factory calibrated, using factory temperature-run data to give a maximum degree of utility and protection.

Bushings—Bushings should be checked regularly. In locations where an outage might cause a serious disturbance, they should receive a semi-annual visual inspection and an annual general inspection.

Fig. 4. Air-cooled transformers should receive periodic cleanings to remove any dust or dirt that might have accumulated in the air ducts. Frequency depends on location. Air should be free from moisture and not over 50 pounds pressure. When only greater pressure is available, care should be taken so that hose nozzle is not applied too close to the windings.

Power Factor Tests

The power factor test will indicate the extent of dielectric losses in condenser bushings and will show the general condition of the insulation. The capacitance measurement is valuable in determining if a weakness exists in any layer of the bushing. If high losses are found, it is best to determine their location before removal of the bushing, for they can often be eliminated by cleaning some surfaces.

Power factors vary with the temperature. A record of test should include the temperature of the bushing as well as the ambient temperature. The upper limit of the power factor of transformer condenser bushings is given in the tabulation on the next page.

Bushing Temp. Deg. C	Power Factor Per Cent
20	2.1
30	2.6
40	3.2
50	4.0
60	5.3

Visual Inspection — Bushings should be inspected for leaking compound, mechanical damage, broken-away cement, broken or cracked porcelains and accumulation of dirt on porcelain. If any of the above are found and cannot be removed by cleaning, the bushing should be removed from service. Leaking compound, even in small amounts, is a potential hazard because moisture may be drawn into the weather casing.

Oil Filled Bushings—Check oil level periodically and adjust the height by adding a small amount through the plug in the cap when necessary. Check condition of oil at maintenance periods by making a dielectric test on a sample drawn at the flange. If the oil tests below 18 kv on a 1/10-inch gap it should be replaced.

Care should be taken not to contaminate the sample through contact with hands or tools. If the dielectric test is low, it is suggested that the cap be tested for tightness. This can be done by testing with dry air at not over 15 pounds pressure. Check for leaks by coating the cap surface with soap lather or see if the pressure holds constant for 30 minutes with pressure source removed.

Bulk-Type Bushings—Bulk-type bushings should be inspected periodically for broken or cracked porcelains and faulty gaskets. On bulk-type bushings rated 6600 volts and above, the exposed metal parts below the cover should be under oil. When porcelains are damaged, replacements may be made in the field by ordering new porcelains and gaskets. When other parts are also damaged, a complete bushing should be ordered from the factory.

Cleaning Porcelains—In cleaning bushings do not use sharp instruments such as knives and scrapers, or abrasives such as sandpaper or emery cloth to clean the porcelains. Cuts and scratches will permit dirt, dust and moisture to accumulate on the surface and will reduce flashover values.

Bushing Gaps—Condenser bushings are normally supplied with gaps set at a value corresponding to the insulation class of the bushing. These not only serve to fix the insulation level, but also protect the porcelain and the bushing cap from injury during flashover. These gaps should be kept on the transformer during operation unless other protective devices are used in the installation.

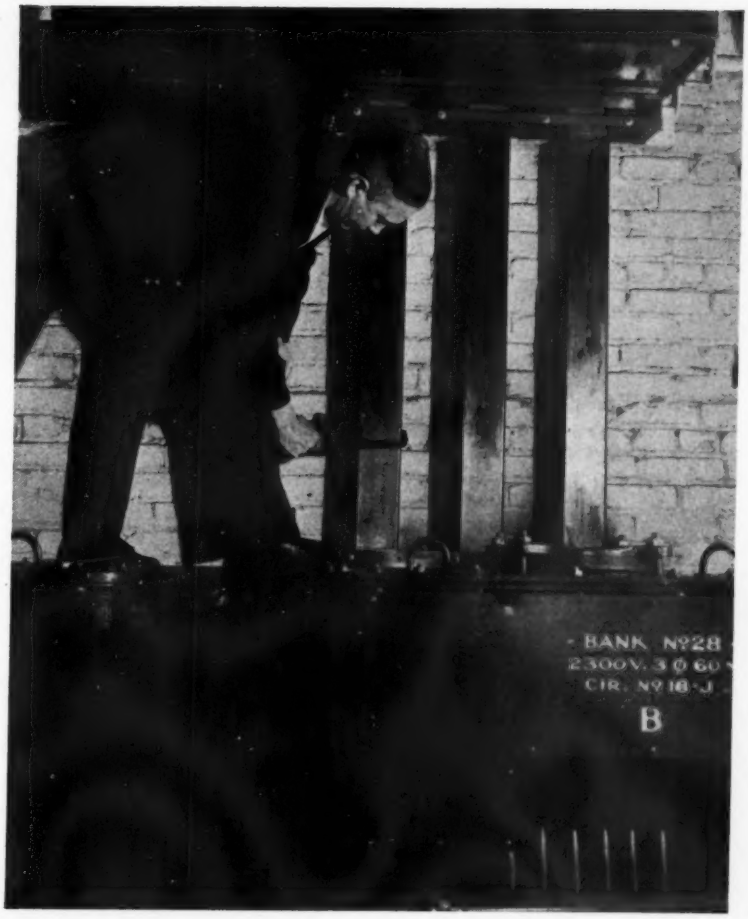

Fig. 5. Check for overload with a clip-on type ammeter. If the load is too high, temporary relief may be found by placing fans around transformer base to dissipate heat.

Repainting—It is desirable to repaint transformers at intervals, to maintain the finish in good condition and prevent the rusting away of steel parts. Local weather conditions cover such a wide range that definite recommendations as to frequency of repainting are not possible.

In general, it is considered good practice to repaint transformers every three or four years. Repainting by flowing is preferable because it tends to produce a uniform coating. Equipment for flow coating can be secured from the manufacturer.

Grounding—The tank of every power transformer should be grounded to eliminate the possibility of obtaining static shocks from it or of being injured by accidental grounding of windings to the case. A grounding lug is always provided on the tank or base for this purpose.

Untanking—When it is necessary to untank a transformer it should be done in dry weather. The core and coils should be protected by canvas or tarpaulin. If transformers are left out of oil for more than 48 hours, they must be dried out before being put into service.

During the time that the core and coils are out of oil they should be kept at a higher temperature than the atmosphere to prevent any condensation of moisture. When the transformer is tanked again it should be filled with oil under vacuum.

Note: When a transformer is untanked for any reason whatsoever, it provides an excellent opportunity for a complete inspection of the core and coils. All loose parts of the mechanical structure should be tightened. All terminals should be checked for tightness, and contacts should be examined for pitting.

Vacuum Filling—Entrapped air is a potential source of trouble in all transformers. In general, it is desirable to fill transformers with oil under full vacuum. The filling of power transformers in the field should be done under as high a degree of vacuum as possible, provided the transformer tanks are designed for this condition. The degree of vacuum should not be less than 25 inches of mercury. Before admitting any oil, it is preferable to maintain the vacuum on the tank for approximately four hours. The oil should then be allowed to enter slowly from the top of the tank; the rate of filling should be controlled by the ability to maintain the vacuum.

Gaskets—For the best joints, recessed gaskets or gaskets with gasket stops should be used. If persistent trouble due to leaks is experienced on older transformers using flat type gaskets, these should be modified to use gasket stops. Gaskets for small openings, which are cemented to the removable cover only, may be used repeatedly provided the gaskets remain undamaged. However, when a gasketed joint with the gasket cemented on both sides is broken, the gasket should be replaced with a new one properly cemented to thoroughly cleaned surfaces. Consult manufacturer for special cleaning tools that are available. In making new gaskets, the gasket material should be cut into strips of the proper width to conform to the contour of the parts to be joined. When necessary to use spliced pieces, the ends should be scarfed, permitting an overlap of four times the gasket thickness along the lap.

Bases and Foundations — The wheels on the transformer base should be greased yearly, preferably in the autumn season, to replenish any grease which may have run out during hot weather. This will prevent the collection of water, and the consequent rusting of rollers and bearings. When moving the transformer on its own wheels and track, it is recommended that the speed should not exceed 15 feet per minute.

Fig. 6. All heat-radiating surfaces should be clean and free from oil and rust. Paint tanks and covers as often as required by local conditions.

Power transformers should be installed on a firm and level foundation. Any appreciable slope of the foundation may produce a low oil level on one side of the transformer. In addition, any shifting of the foundation after installation may cause strains on bushings and connecting lines.

Cooling Equipment

Self-Cooled — Self-cooled transformers depend entirely on the surrounding air for carrying away their heat. For this reason care must be taken to provide adequate ventilating facilities. Self-cooled transformers should always be well separated from one another and from adjacent walls and partitions in order to permit free circulation of the air. In the average case, the separation should not be less than 24 to 36 inches, depending upon the contour of the space or cell in which the units will operate. For indoor installation the room in which the transformers are placed must be well-ventilated so that the heated air can escape readily and be replaced by cool air from the outside. The recommended operating ambient temperature limit is 30/ C.

Care should be taken to have both valves of each radiator completely open. A check may be made by feeling the individual radiators. Any radiator considerably cooler than the rest would indicate a closed or partially closed valve. All radiator leaks should be repaired promptly by welding or calking. Information concerning special accessories for removing radiators from transformer tanks, and for removing rust spots on the radiator surfaces may be obtained from the manufacturer.

(Continued on page 54)

NATIONAL ELECTRIC PRODUCTS CORP
SPELLERIZED
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SCALE-FREE
PITTSBURGH, PENNA.
UNDERWRITERS' LABORATORIES, INC. INSPECTED
RIGID STEEL CONDUIT
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"TO KEEP AWAY FROM RUST... TO KEEP WIRING SAFE... RIGID STEEL CONDUIT-SHERARDUCT"
WIRING SYSTEMS
WIRES AND CABLES
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SPELLERIZED
SHERARDUCT
SCALE-FREE
PITTSBURGH PENNA.
UNDERWRITERS' LABORATORIES, INC. INSPECTED
RIGID STEEL CONDUIT

GREAT NAMES in American Progress

ROBERT FULTON, BOAT BUILDER – On a fateful Friday in 1807, a skeptical crowd gathered at the foot of Cortlandt Street, New York. They came to watch "Fulton's Folly" attempt the "impossible" by traveling without sails from New York to Albany. Those who came to jeer stayed to cheer. "Crazy" Bob's puffing, snorting Clermont wheezed away from the jetty and grunted upstream against the wind at the miraculous speed of four miles an hour. On that day, Robert Fulton, well-nigh penniless dreamer, revolutionized the water-borne transportation of the world.

AMERICAN BLOWER

American Blower products have contributed much towards the progress of American industry – progress that today is making it possible for America's vital industries to outproduce the world. In the great public utilities, the steel industry, in the manufacture of petroleum products, chemicals, in food processing, mining, smelting and refining, in hospitals, schools, public buildings and homes, American Blower air handling equipment has kept pace with progress.

CONTRACTORS—DEALERS— We're working 100% for victory. But you can still buy American Blower products for vital war work. After victory we'll be ready with the most complete line of heating, ventilating and air handling equipment in history.

Utility Set

ARMY E NAVY
For excellence in production

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of AMERICAN Radiator and Standard Sanitary Corporation

NEWS of the INDUSTRY
National and Southern

Westinghouse "Conservice" Training Produces Results

Although the Westinghouse "Conservice" program for appliance servicemen is less than six months old, 4,000 service people already have taken the course to become better qualified to help keep the nation's refrigerators, ranges, washing machines and other appliances in good working order for the duration. Approximately half of the 250 Conservice schools scheduled throughout the nation have been conducted, according to L. K. Baxter, manager of the Service Department at the Westinghouse Electric Appliance Division, Mansfield, Ohio.

For 80 per cent of the people attending the schools, the training is a "refresher" course because that percentage of the service personnel consists of veteran experts who have been servicing appliances for years. The other 20 per cent are people who have never been in service work before. For them, the training is a school that gets them started on the right foot—first by teaching them the fundamentals of electricity and home wiring, and following up with step-by-step instructions in appliance service work.

For example, in many small towns the wives and daughters of Westinghouse dealers have taken the course to learn how to help out in this emergency. The same applies to a number of dealers who previously did no actual service work. Also, scores of high school and vocational school students have attended the Conservice schools with a view of becoming appliance service men.

Because the job of providing adequate service is a serious problem for all appliance dealers, Conservice schools have been thrown open to service staffs of not only Westinghouse dealers but others.

More than 4,000 appliance service men such as those shown here have taken the Westinghouse "Conservice" training course during the past six months to keep posted on the latest techniques developed to assure uninterrupted wartime operation of refrigerators, ranges, laundry equipment and other appliances. In the photograph above, Dale Balph (pointing with pencil) is tracing the circuit of an electric coffee maker at a Westinghouse Electric Supply Company Conservice school.

G-E Seeks Information On Postwar Appliances

To its more than 225,000 stockholders General Electric has mailed the 184th dividend on the common stock and a request that each stockholder "turn consumer" and give the company advice on the subject of postwar electrical appliances and services for the home. The request took the form of an illustrated questionnaire and return postcard, giving designers' and engineers' ideas and brief information on suggested improvements in electric refrigerators, ranges, kitchen layout, laundry equipment, air conditioning, and small appliances. Replies from stockholders will be correlated and referred back to engineers and commercial managers for their guidance.

Answering the question as to the nature of immediate postwar appliances, the booklet points out that there will be few changes until new materials and new facilities—now devoted to war production—become available.

"The important thing, it seems to us, is to see that we give wider distribution to the things we have, that we put down in the homes of all income groups the high-quality electrical equipment that will enable people—many for the first time—to live efficiently and economically and happily. Our big job is more goods for more people at less cost," writes Gerard Swope, president of the company.

Among the suggested changes, which were on drawing boards long before war was declared, is a round refrigerator with revolving instead of the usual sliding shelves, a refrigerator with a large frozen food compartment, and quick-freeze cabinets, reflecting the new popular interests in home storage. Information is also given on an electric range with a high

oven and an automatic clothes washer which fills itself; presoaks clothes; washes, rinses, spin dries, empties, and shuts itself off without attention. Attention is called to an electric clothes dryer working on the tumbler principle.

Stockholders are asked if summer air conditioning at less than $200 per room would be attractive, how they prefer to have their kitchen arranged, how hot they like their water, and even by what kind of alarm they prefer to be awakened in the morning.

The electric blanket, which enjoyed limited distribution before the needs of war turned it into an electrically-heated flying suit, poses a distribution problem, and the questionnaire asks whether it should be sold as an appliance or an article of bedding.

Postwar Problems Theme Of I.A.E.L. Meeting

The special activities being conducted by electrical leagues to aid in the conservation program and the war effort, and the problems they must be prepared to assist in meeting after the war, will constitute the theme of the Eighth Annual Conference of the International Association of Electrical Leagues at the Netherland Plaza Hotel, Cincinnati, Ohio, September 16 and 17.

John A. Morrison, Philadelphia, IAEL president, has appointed a Program Committee consisting of: C. H. Christine, St. Louis, chairman; J. S. Bartlett, Washington, D. C., and E. P. Zachman, Cincinnati, Ohio.

The first day of the conference will be devoted to discussing current activities of leagues as they contribute to the war effort, and the second day to considering how leagues can be of greatest assistance to the local electrical industry in meeting the many postwar problems.

Subjects to be discussed the first day will include: appliance and radio repair service plans, contacts with various housing agencies, courses for electricians, dealer counselor service, educational meetings for electrical maintenance engineers, cooperation with civic and trade bodies, wiring service to home owners.

The program for the second day will deal with the several major markets of the industry: residential, commercial, industrial and rural. There are a host of topics to be considered under these general headings including — how post-war housing construction will be financed; the part that prefabrication will play; new applications for electric service in commercial buildings; advances in lighting tehnique for stores and offices; problems of reconversion in industrial plants; production of new products and the development of their markets.

The general sessions are open to representatives of all electrical leagues and other members of the electrical industry.

BENDIX PROMOTES WARTIME APPLIANCE CARE—Here is graphic proof of the serious interest housewives have in information which will enable them to keep their household appliances operating. At the request of Mrs. Ellis Arnall (center), wife of Georgia's new governor, Cal Mitchell, southeastern manager for Bendix, gives the staff of the governor's mansion in Atlanta some pointers on the care and maintenance of the Bendix home laundry. Alvin Arnall, the governor's young son, is an interested spectator.

War Bond Portfolio Distributed by Norge

Hundreds of thousands of copies of an attractive budget portfolio for war bonds, in red, white and blue, have been distributed to applicants throughout the North American continent by the Norge Division of Borg-Warner Corporation.

First offered through Norge distributors and dealers, national advertising in magazines and newspapers brought in a million requests for the war bond portfolios and this public want for the handy containers continues to be urgent, said Howard E. Blood, president of the corporation. The company has received more than 100,000 commendatory letters regarding the portfolio besides a special citation from the United States Treasury Department for the campaign.

The portfolio contains eight "pockets" or compartments, each large enough to contain ten war bonds and indicated spaces for keeping a record of each bond, including series numbers, name of holder, bond cost, maturity value and profit at maturity. Each compartment also contains a special brief message, urging savings.

Motor Replacement Covered By WPB Interpretation

The sale of a fractional horsepower motor to replace one broken down is considered a maintenance and repair transaction, where the broken one is taken in by the repairer.

This transaction, according to an Interpretation issued by the War Production Board, comes within the exemption provided by Order L-123, covering the delivery of maintenance and repair parts.

Kelvinator Launches Wartime "Idea Exchange"

The Nash-Kelvinator Corporation has just made public the full details and operating procedure of a new project designed to broaden the exchange of valuable and timely ideas and suggestions for solving wartime homemakers' problems as they arise.

Although very simple, the plan has already been hailed as realistic and practical by interested Government officials and outstanding homemakers. Here is how it operates:

(1) Each month Kelvinator will announce to the Nation's home economists, by means of a four-page front-of-the-book supplement in the magazine, "What's New In Home Economics," a timely "project" selected in advance by a panel of Washington authorities. Project number 1 already announced covers the subject, "Aids to Home Preservation of Fall Vegetables and Fruits."

(2) Forty war bonds totaling $1,000 will be offered each month to those home economists who offer ideas and suggestions on the current subject.

(3) A Board of Judges, made up of the following people, will select the 40 best contributions:

Dr. M. L. Wilson, Nutrition and Food Conservation Chief, Nutrition and Food Conservation Branch of the Food Distribution Administration.

Dr. Louise Stanley, Special Assistant to the Administrator, Agricultural Research Administration.

George E. Farrell, Principal Agricultural Specialist, United States Department of Agriculture.

Miss Gertrude Warren, Senior 4-H Group Organizer, Specialist in Extension Service, United States Department of Agriculture.

Mrs. Philip L. Crowlie, Typical American Housewife, Office of Price Administration.

(4) Kelvinator will then publish each month's selections in a series of pamphlets entitled, "Helps for Homemakers." These will be available from Kelvinator to all home economists throughout the country for use in their wartime work and for distribution to individual housewives.

In essence the project is a means of seeking out the great numbers of "self-help" ideas that exist throughout the nation and to make them available to everyone simply and quickly.

"Because the project is keyed to the solution of currently anticipated real problems, there will be no lost motion in either gathering or disseminating 'general' homemaking information," said C. T. Lawson, general sales manager of Kelvinator, in announcing the Kelvinator Wartime Idea Exchange. "We are pleased with the practical simplicity of the project and feel confident that it will be of very real service to a great portion of our 30,000,000 homemakers. We are glad also to know that both the monthly Kelvin-Grams and the resulting 'Help for Homemakers' pamphlets offer additional means of disseminating accurate and official Government home front information when and where it is needed most."

HOTPOINT BUILDS MACHINE GUN TRAINERS—G. H. (Rock) Smith, Hotpoint general sales manager, takes a "whirl" at the .30 calibre anti-personnel machine gun trainer which is an adaptation of the M-9 .50 calibre trainer shown at the left. The training guns developed by Hotpoint are in use in machine gun schools in many states and are being installed as fast as Hotpoint factories can turn them out. Gregory Rees, development engineer on training devices, is shown at the left, while Thomas Swisher of his department watches the controls from the rear.

New Generating Capacity Approved for the South

The Nation's power capacity will be upped approximately half a million kilowatts for 1945 operation under a program announced recently by J. A. Krug, director of the Office of War Utilities, War Production Board. This will be the smallest annual increase since the beginning of the war program.

The program will consist largely of additions to present plants, Mr. Krug said. He listed these specific projects:

1. Installation of Grand Coulee Unit No. 7, adding 108,000 kilowatts rated capacity to the great hydro development in the Pacific Northwest.

2. Addition of approximately 100,000 kilowatts in existing dams of the TVA system. Both this development and the Grand Coulee unit will be scheduled for completion sometime in 1945. No other hydro projects will be scheduled for 1945 operation.

3. A 20,000 kilowatt steam-power addition to the San Antonio, Texas, municipal plant, to be completed late in 1944.

4. An additional boiler for the Jacksonville, Florida, municipal plant which will increase capacity 15,000 kilowatts. This will also be completed in 1944.

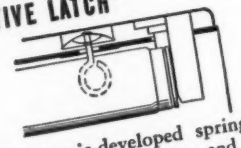
5. An additional unit of 20,000 kilowatts for the Evansville, Indiana, steam plant of the Southern Indiana Gas and Electric Company to be completed in 1944.

6. A 25,000 kilowatt unit for the St. Petersburg, Florida, steam plant of the Florida Power Corporation.

7. A 20,000 kilowatt steam plant at Pensacola, Florida, to be built by the Gulf Power Company. These latter two are scheduled for

SYLVANIA

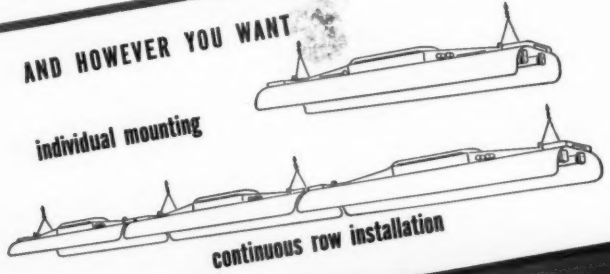
EXCLUSIVE "CAPTIVE LATCH"



This Sylvania-developed spring-type fastener saves installation and maintenance man-hours. It stays put while lamp is in service despite any kind of vibration. It locks or unlocks with a simple quarter turn. No tools are necessary.

HANG IT ANY WAY YOU WANT

AND HOWEVER YOU WANT



MORE LIGHT FROM LESS WEIGHT

Sylvania pioneered composition reflectors for fluorescent fixtures and "proved them in industry."

This composition reflector has an efficiency of 86 per cent — even higher than that of prewar porcelain-enameled metal in conventional contours.

It is fabricated to Sylvania's specifications from a strong and durable composition. Coated with MIRACOAT inside and a handsome French Gray outside, it stands up under extreme humidity and temperature conditions.

- √ Impervious to frequent washing
- √ Gives more light.
- √ Lighter and easier to handle.

INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES

Check these points of Superiority

- ✓ Easier installation
- ✓ Speedier maintenance
- ✓ Cantilever construction
- ✓ Simple design
- ✓ Standard interchangeable parts
- ✓ Enclosed ballasts
- ✓ Single or continuous row hanging

The Fixture of the Future against the field

Compare the design and construction of the Sylvania Fixture of the Future with any other fixture now available, and it wins hands down.

It is much more than a design to eliminate the metallic reflector and cut down top-housing weight to the three-pound requirement. Sylvania engineers attained a new standard of perfection, far ahead of its time.

A revelation of simplicity, this new Sylvania fixture is available in both 100-watt and 40-watt lamp size. In either length, *one* standard fixture fills any and all industrial lighting assignments.

Unparalleled in adaptability, it may be installed individually or in continuous rows. It is fitted with knock-outs for any practical mounting. The optional number of lamps in the regular 40-watt size gives new flexibility in meeting varying foot-candle requirements.

The streamlined top-housing, constructed like a cantilever bridge, encloses the ballast — protects it from dust — provides cooler performance. The starter sockets are honestly accessible — inset from the side to avoid dust, dirt and moisture. Pull-chain switch is optional.

The Sylvania Fixture of the Future carries Underwriters' Laboratories approval and our own standard guarantee. For specifications and prices, write Dept. ES-8, Sylvania, Ipswich, Mass.

"Everything that's Finest in Fluorescent"

★ ★ **SYLVANIA** ELECTRIC PRODUCTS INC.

LIGHTING DIVISION, IPSWICH, MASS.

ND ACCESSORIES, RADIO TUBES, ELECTRONIC DEVICES

completion early in 1945.

Because of the long fabrication and construction cycle involved in power plant expansion, Mr. Krug explained that it was necessary to authorize these essential projects at the present time.

In addition to these specific projects, Mr. Krug said, as much as 200,000 kilowatts of new capacity will probably be needed for industrial sections of the country which are dependent on steam power and where 1944 loads are expected to run close to capacity. Sizes of the individual units and the exact locations for them have not as yet been determined, he said. As these additional units would not be needed until well into 1945, no decision is necessary immediately.

Sylvania Expedites Service in the South

To expedite service and delivery to the important war industries of the Southeastern area, Sylvania Electric Products, Inc., nationally known manufacturers of fluorescent lamps, fluorescent lighting fixtures, incandescent lamps, wiring devices, radio tubes and special electronic products, has established warehouse facilities and divisional sales offices at Atlanta, Georgia.

The new office and warehouse, located at 685 Whitehall Street, S.W., Atlanta, will be under the supervision of Hugh Saussy, manager of Sylvania's Southeastern Division. The new warehouse will serve customers in the states of Georgia, Florida, Alabama, Mississippi, Louisiana and Tennessee with all products of the Lighting Division. Radio tubes will continue to be warehoused and handled by Fulwiler and Chapman, also located in Atlanta.

Don G. Mitchell, vice president in charge of sales, Sylvania Electric Products, Inc.

Over one hundred Sylvania distributors and important customers in the Southeastern area gathered in a general meeting at the Hotel Henry Grady, Atlanta, on July 13 to celebrate the opening of the new warehouse. The meeting was followed by a banquet in the evening at the Atlanta Athletic Club, at which a program of professional talent was supplemented by an entertaining comedy skit by a group of Sylvania engineers and salesmen.

Principal speaker at the meeting was Don G. Mitchell, vice president in charge of sales, who gave an interesting talk on electronics. Discussing the part which electronics is playing in the war, Mr. Mitchell said, "When the story of this war is written, the application of electronics to the airplane, to navigation, and to many weapons of war will seem more fantastic than a Jules Verne dream."

Following the war, Mr. Mitchell feels that electronics will exert an influence on almost every industry, and will eventually find many applications in the home. He cautioned his audience, however, that some of the publicity on electronics has promised too much, and that it will take considerable time to adapt electronic developments to peacetime pursuits.

R. H. Bishop, general sales manager, Sylvania Electric Products, Inc.

In addition to the invited guests from distributing companies, utilities, war industries, Government engineering departments, and large industrials, the following Sylvania executives from New York and Salem headquarters of the company were present at the meeting: R. H. Bishop, Paul S. Ellison, Samuel H. Eaton, Don P. Caverly, F. W. Mansfield, Jr., James R. Duffy, George W. Field and Thomas J. McHugh.

Sam H. Eaton, left, manager of commercial engineering for Sylvania, shakes hands with George W. (Chic) Fields, field engineer, at the conclusion of their demonstration before the meeting in Atlanta which marked the opening of Sylvania's Atlanta warehouse and division sales office. The demonstration emphasized the easy installation features of Sylvania's new industrial fluorescent fixture.

E.E.I. Issues Report on Home Dehydrators

Electric utilities and agricultural colleges have carried on extensive research on the design and

testing of home dehydration equipment. The Edison Electric Institute has assembled some of the results of this experimental work in a report entitled, "Design and Construction of Home Dehydration Equipment." This report is available at $1.00 per copy from Edison Electric Institute.

The report includes test data on several dehydrators and general information on home-constructed dehydration equipment with 18 pages showing construction details of typical dehydrators developed. Also included is a list of recent bulletins on home dehydration and home-made dehydrators and a report of the Home Service Committee of the Edison Electric Institute on electric oven dehydration.

Alvah Small Honored By Chicago Underwriters

Alvah Small, president of Underwriters' Laboratories, was the guest speaker on the Chicago Board of Underwriters radio program "For Distinctive Service" broadcast from Station WGN, early in July.

Mr. Small was awarded a distinctive service citation for his 37 years of fire prevention work at the Laboratories and as chairman of the committee which formulates the National Electrical Code, most widely adopted and enforced safety code in the United States. He talked on how we can make our lives, homes, and jobs safer from fires and accidents.

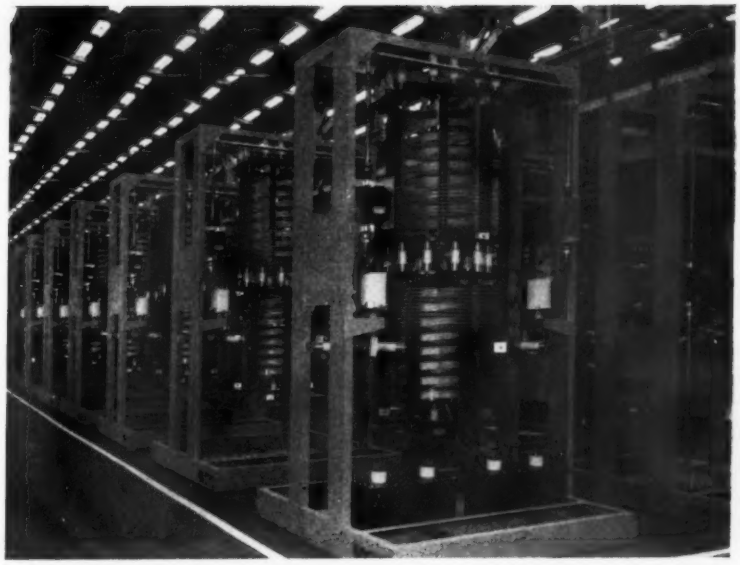
"Preventing fires and accidents in homes is just as important as preventing them in industry," said Mr. Small, pointing out that during 1942 fires in the United States caused 8,000 deaths and destroyed nearly 315 million dollars of property, while other accidents killed 85,000 persons.

The safety expert showed that the rules of fire and accident prevention in home, factory and office are simple and are based on common sense. "People who are careful and thoughtful," said Mr. Small, "who exercise good judgment and are reasonably neat and cleanly in their housekeeping are rarely visited by fires or accidents."

Mr. Small emphasized that the careful selection of mechanical and electrical equipment of buildings of all kinds is highly important to safety, noting that even at this time there is a great variety of materials and products to choose from as thousands of manufacturers have for many years been submitting their products to rigid tests to make certain that they are safe for the public to use.

The new safety problems which are arising, particularly those involving the use of substitutes for metals and other materials which are now scarce, are being rapidly solved.

"By test and trial, investigation and research," says Mr. Small, "we are finding the answers."



1400 KW FOR ELECTRONIC TIN FUSING—Key units behind the induction heating coils that flow the electrolytically deposited tin plate on steel strip into a smooth, shiny surface are power rectifying tubes, high frequency oscillator tubes and the oscillator tank circuits. Direct-current power at 17,000 volts is applied to the vacuum tube oscillators, similar to radio broadcasting transmitters. The d-c is then converted to high-frequency a-c power of 200,000 cycles per second and fed into the tuning circuit. Water cooled copper conductors carry this high-frequency power to the induction heating coil that surrounds the tin coated steel strip. Seven of these 200-kw tuning units, soon to be shipped to steel mills throughout the country, are shown during assembly at the Westinghouse Radio Division Baltimore.

Alvah Small

I.E.S. Postwar Plans Include Lighting Handbook

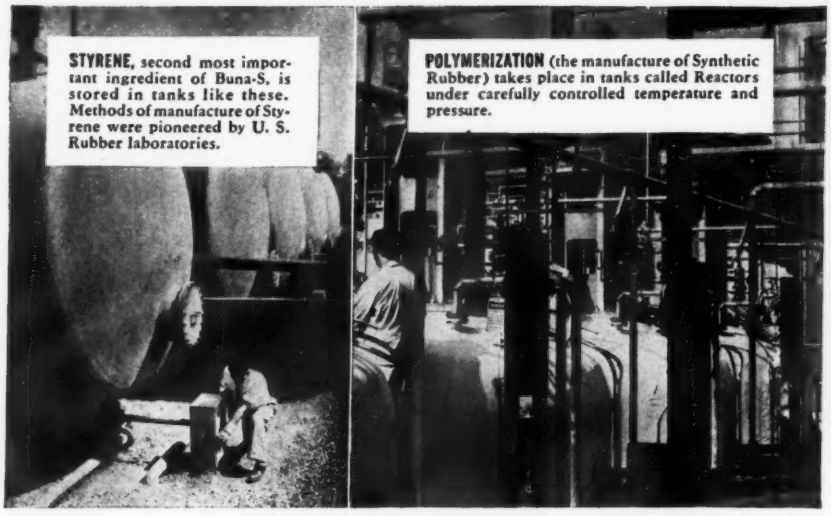
Publication of a lighting handbook and employment of a technical secretary were decided upon for the post-war period at a recent meeting of the council of the Illuminating Engineering Society, based on recommendations presented by the Society's Committee on Post-War Planning.

The technical secretary, who will serve under the executive secretary at Society headquarters, will function on a full-time basis. His studies will include the taking of minutes at technical committee meetings; send out notices and questionnaires, under the direction of the committee chairmen; contact educational institutions and research organizations for specific research projects to be undertaken by such organizations under the auspices of the Society; prepare special reports on the progress of such projects; and, in general, stimulate and

BUTADIENE, a gas and the chief constituent of Buna-S synthetic rubber, is stored as a liquid under pressure in great spherical tanks at a synthetic plant built and operated for the Government by United States Rubber Company.

WASHING. After coagulation, flocs or crumb of synthetic rubber, looking like popcorn, are washed to remove chemicals.

TUBING—that looks very much like a butcher's meat grinder—squeezes synthetic rubber into strings and removes excess water before the synthetic goes to the driers for further processing.



STYRENE, second most important ingredient of Buna-S, is stored in tanks like these. Methods of manufacture of Styrene were pioneered by U. S. Rubber laboratories.

POLYMERIZATION (the manufacture of Synthetic Rubber) takes place in tanks called Reactors under carefully controlled temperature and pressure.

FINISHING of synthetic rubber includes milling to proper plasticity and uniformity. Here you see synthetic rubber leaving the finishing mill in the form of a sheet ready to be baled for shipment.

UNITED STATES R

WHAT IS SYNTHETIC RUBBER?

ynthetic rubber can be made from gasoline, coal, alcool and gases kept liquid under pressure. This means hat a synthetic rubber plant is made up of hundreds f miles of pipe, acres of tanks and more acres of giantzed chemical retorts or reactors.

Manufacturing synthetic rubber is a process requirng vast and special equipment. Each of the five basic ommercial types is produced in virtually the same way . by hooking little molecules together to form increasngly larger ones. But... because each of the basic synhetic rubbers is capable of myriads of variations... it what is done to the synthetic rubber after it is proced that really counts. It must be processed. Reagents nd catalysts must be added to it. It must be specifilly compounded for the specific task. United States ubber Company pioneered in developing many of the major processes used in fitting synthetic rubber for the jobs it must handle.

This is rubber chemistry...and United States Rubber Company is the largest manufacturer of rubber chemicals in the world. Throughout our hundred years' history, we have worked with rubber, improved it, broadened its uses. We pioneered in the production of conductive rubber, cellular rubber... a score of other revolutionary advances in rubber manufacturing.

It is only natural that we have built up a tremendous backlog of knowledge and experience in processing rubber to handle a certain definite job. Today, this fund of knowledge of rubber chemistry is being drawn upon to the fullest in our work with synthetic rubber to supply the Armed Forces and war industries with the synthetic rubber and synthetic rubber products they need.

SYNTHETIC RUBBER HOSE for fuel has been made commercially by U. S. Rubber since 1931. Synthetic rubber has marked superiority to natural rubber in its resistance to deterioration due to oil or gasoline. Synthetic rubber hose plays an important part in speeding the shipment of vital fuels.

RUBBER PONTONS for the Army Engineers are made with synthetic rubber. They are used not only as supports for temporary, floating bridges, but also as ferries for transporting men and equipment to establish a bridgehead. After use they can be deflated, repacked into small cases and trucked away for repeated service.

CONDUCTIVE RUBBER TUB LINERS are used in munitions plants for handling highly explosive materials like T. N. T. They are an important safety factor because they prevent mechanical as well as electrical sparks and dissipate static electricity before it can cause a serious explosion. This is another war job being handled efficiently by synthetic rubber.

SYNTHETIC RUBBER TIRES for the Armed Forces and industrial uses combine latest developments of the chemistry of rubber and textile manufacture. U. S. Royal Airplane Tires with treads made of synthetic rubber and bodies built of synthetic fiber are proving that they can take the shock of giant bomber landings.

S RUBBER COMPANY

1230 SIXTH AVENUE, ROCKEFELLER CENTER, NEW YORK • IN CANADA, DOMINION RUBBER CO., LTD.

facilitate the various technical and research projects carried on under the Society's sponsorship.

The handbook, according to present plans, will include the solutions of specific problems in industrial and commercial lighting, as well as the discussion of the general principles of illumination design and methods of calculation. It will be supervised by a Handbook Publication Committee headed by S. B. Williams, editor of Electrical World, whose members will select, subject to appointment by the council, a handbook editor to be employed by the Society for the purpose of writing, compiling and publishing the handbook.

It will also recommend for appointment by the council a group of technical experts to be known as a "board of consulting editors for the handbook" who will collaborate with its editor, review manuscripts for inclusion in the handbook and accept responsibility for its technical correctness. The consulting editors will function under the general jurisdiction of the handbook publication committee. The handbook will be revised and augmented at suitable intervals, to keep pace with progressive changes in lighting standards and practice.

The I.E.S. Committee on Post-War Planning is composed of Ward Harrison, General Electric Company, Nela Park, Cleveland, as Chairman; G. K. Hardacre, Public Service Company of Northern Illinois, Chicago, Illinois; R. W. Staud, Benjamin Electric Manufacturing Company, Des Plaines, Illinois; E. M. Strong, Cornell University, Ithaca, New York; and S. B. Williams, McGraw-Hill Publishing Company, New York City.

Vacuum Cleaner Price Ceilings Interpreted

Maximum prices at all levels for used household vacuum cleaner attachment sets, when sold in combination with used vacuum cleaners, may not exceed prices specifically listed in the regulation covering this merchandise, the Office of Price Administration reports.

Any other prices for attachment sets would raise the price level for combined vacuum cleaner and attachment sets above the adjusted base-period prices for the same combination, and therefore would be contrary to the intent of the regulation, OPA said.

Amendment No. 2 to Maximum Price Regulation 294 (Used Household Vacuum Cleaners and Attachments), effective July 3, 1943, in clarifying provisions in the regulation regarding the sale of attachment sets, points out that retail maximum prices for sets ($5.50 for a standard set and $8.50 for a deluxe set)—listed separately from those for used cleaners—were especially calculated to bring the prices of combination vacuum cleaner and attachment sets up to the level of the adjusted base-period prices for this combination, and may not be varied from that combination ceiling.

Electrical Meeting Held in Raleigh

"Present Maintenance and Post-War Standards" was the theme of the annual Institute for Electrical Inspectors, Contractors and Electricians of North Carolina, held at Raleigh, N. C., July 13-14.

Sponsoring the Institute were the North Carolina Chapter of the International Association of Electrical Inspectors, the North Carolina Board of Examiners of Electrical Contractors, and the North Carolina Association of Electrical Contractors. N. E. Cannady, of Raleigh, chairman of the state chapter of the International Association of Electrical Inspectors and chairman of the State Board of Examiners, was in charge of arrangements.

The Institute was designed to provide an "opportunity to obtain from men in the front ranks of industry, information on the new Emergency Code rules, approved substitutes for essential materials, maintenance in industrial plants, protective lighting, civilian defense, priorities, etc."

Speakers and their topics included: S. Paul Vecker, of Raleigh, vice president of the Carolina Light and Power Company, "Where Do We Go from Here?"; Victor H. Tousley, of Chicago, secretary-treasurer of the International Association of Electrical Inspectors, "Interim Amendments"; E. G. Romeiser, of Union City, Ind., field engineer for porcelain insulated wiring systems, "Wiring Pre-fabricated Homes"; S. J. Rosch, manager of insulated products development for the Anaconda Wire and Cable Company, Hastings-on-Hudson, N.Y., "Adventures in Science"; L. P. Spoon, electrical engineer for Thomas and Betts, Inc., Elizabeth, N. J., "Pressure Connectors"; George C. Richards, of New York, licensor's agent, "Rub-R-Less Wire"; Howard H. Weber, assistant manager of wire sales for U.S. Rubber Products, Inc., New York City, "Rubber Covered Wire"; H. G. Knoderer, of Bridgeport, Conn., commercial engineer for the General Electric Company, "Maintenance of Fluorescent Lighting"; Lee Adams, of Schenectady, N.Y., assistant to the vice president of the General Electric Company, "Motors in Wartime"; L. M. Keever, associate professor of electrical engineering at North Carolina State College, Raleigh, "Maintenance of Motors and Equipment."

Discussions were led by James S. Mahan, of Fustat Manufacturers, Chicago, on "Wartime Use of Type 'S' Fuses," and N. E. Cannady, of Raleigh, on "Uniform Electrical Ordnances."

Other speakers included Governor J. M. Broughton, of North Carolina; William P. Hodges, North Carolina Insurance Commissioner; and R. I. McMillan, North Carolina Director of Civilian Defense.

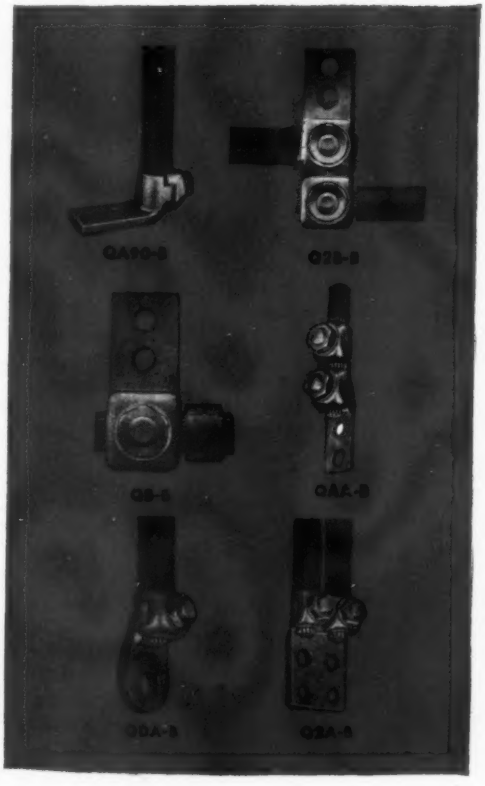
WFA Sets Procedure for Copper Wire Distribution

The War Food Administration has announced procedure by which farmers may apply for copper wire for farmstead wiring, in line with the WFA responsibility for the distribution of this farm supply item. County USDA War Boards will carry out the distribution program locally.

The procedure just announced replaces former distribution methods, by which farmers applied for preference ratings for copper wire, and provides that both old and new users of electricity shall obtain copper wire in the same manner. The new distribution system is in line with the Controlled Materials Plan of the War Production Board governing the distribution of critical materials, of which copper is one.

Under the Controlled Materials Plan, the Department of Agriculture, as a claimant agency for critical materials, has been alloted a stated amount of copper to be used for all agricultural purposes during the three months that began July 1. Copper wire for agricultural uses comes from agriculture's allotment of copper, and

Burndy SCRULUGS and QIKLUGS



Both these favorites are *unit* assemblies. Thus cables can be inserted easier and quicker . . . and there are no extra parts to loosen or lose. This feature assures a *stronger, more efficient* connection, too. Both are furnished with tongues blank, or drilled as required.

The Scrulug provides extreme compactness, with high mechanical strength. Only 4 sizes are required to accommodate cables ranging from #4 to #200 . . . or from #14 to 4/0 strand.

The Qiklug also provides extreme compactness, and is equipped with an oversize stud to eliminate all danger of stripping or distortion when tightening. And only 11 sizes of the standard Qiklug are necessary for cables ranging from #3 to 2000 mcm. Also supplied in variations to meet all connector needs.

Catalog giving complete information on these and other time-saving, cost-cutting Burndy connectors gladly sent on request.

Headquarters for connectors

Burndy

BURNDY ENGINEERING CO., INC.
107 Eastern Boulevard • New York 54, N. Y.

State and County quotas of the wire are established on a quarterly basis. States quotas for the third quarter of this year, beginning July 1, have been sent to State War Boards, who will determine county quotas.

The farmer may apply to his County War Board for an allotment of wire. If the proposed use meets the standards for essential permitted uses, the Board will issue him a Copper Wire allotment Certificate. The applicant then presents this certificate to a local supplier for the purchase of wire. If the certificate is not surrendered to a supplier within 10 days after the issuance date, it becomes void. The supplier will use the certificate to obtain supplies or replacements.

WFA officials said that approval would be given only for essential needs which will add to the food production program or save labor on the farm. The maximum amount of copper wire which can be alloted to new users of electricity, after a power line extension has been approved, will be 75 pounds for any one farm. The number of livestock and poultry on the farm will determine the maximum amount of wire which can be obtained. Where an extension of farmstead wiring is requested on a farm already served by electricity, the maximum allotment will be 50 pounds of wire.

While allotments of wire will be released for essential food production and labor saving purposes, copper wire cannot be made available for farm dwellings. Also, new users of electricity must be able to qualify for power line extensions before they will be eligible for copper wire under the new distribution program. To qualify for a power line extension, a farm is required to have a specified number of animal units and be within a reasonable distance from a power line. Old users of electricity who wish to extend electrical service on their farms, are required to meet the same standards.

Southern Advertising Shares In National Honor Awards

Southern companies were well represented among the winners in a contest conducted by the Public Utilities Advertising Association to determine the best advertising developed by utility companies in 1942. Not only were there more companies entered in the contest this year, but the quality of advertising showed marked improvement, said E. N. Pope, of Carolina Power & Light Co., chairman of the PUAA contest committee.

Among the winners in the national classifications were New Orleans Public Service, Inc., Georgia Power Company, Public Service Company of Oklahoma, and Potomac Edison Company.

The awards to New Orleans Public Service were for entries in the Nutrition Promotion, Transportation Advertising, and Window or Interior Display classifications.

Georgia Power Company ranked first in direct mail advertising in both the residential and industrial-commercial classifications. Their winning copy consisted of issues of "Round the Home," a publication for rural customers, and "Bright Spots," a publication for commercial and industrial customers, both of which are edited by Donald Moore.

The Public Service Company of Oklahoma received its award in the classification: Newspaper Advertising Supporting the War Effort. The Potomac Edison Company's award was in the Residential Customer Bill Enclosure classification.

THREE-OF-A-KIND IN ATLANTA—When George T. Marchmont, W. Austin Emerson, and Robert A. Clarke (left to right above) gathered for a friendly chat at a recent meeting in Atlanta, Electrical South's representative was interested in learning that the "long arm of coincidence" had certainly touched the careers of these three men. Natives of Georgia and Florida, all three were educated in Georgia public schools; all three were graduated from Georgia School of Technology (Georgia Tech); all three became associated with electrical wholesaling organizations; and, today, all three are southeastern district managers of national electrical wholesaling organizations with headquarters in Atlanta. Mr. Marchmont is southeastern district manager for Graybar Electric Co.; Mr. Emerson is southeastern district manager for Westinghouse Electric Supply Co.; and Mr. Clarke is southeastern district manager for General Electric Supply Corp.

Additional Restrictions On Electrical Conduit

Additional restrictions on the manufacture and installation of rigid electrical conduit, electrical metallic tubing, flexible metal conduit or tubing, and raceways are imposed by Limitation Order L-225 as amended recently by the War Production Board. The amended order effects further savings in steel.

Manufacture of electrical metallic tubing (commonly known as thin wall conduit) is limited to 75 per cent of 1941 production and manufacture of flexible metal conduit or tubing is limited to 50 per cent of 1941 production by the following provisions of the amended order; metal used in the manufacture of thin wall conduit during any month is restricted to 1/16 of the total weight of metal used during 1941, and metal used in the manufacture of flexible metal conduit during any month is restricted to 1/24 of the total weight of metal used during 1941.

Limitations on the use of metal in rigid electrical conduit — commonly known as heavy wall conduit—and in raceways, as established in the original order issued in ecember 1942, remain unchanged; in any calendar quarter

(Continued on page 54)

PERSONAL NOTES
About Men You Know

Howard M. Sharp, manager, Lighting Bureau, Buffalo, Niagara and Eastern Power Corporation, Buffalo, N. Y., has been elected president of the Illuminating Engineering Society, according to announcement by the Society. Mr. Sharp will assume his new duties October 1st.

Howard M. Sharp

Other officers elected to serve with Mr. Sharp are: general secretary, **G. K. Hardacre,** Public Service Company of Northern Illinois, Chicago; treasurer, **S. G. Hibben,** Westinghouse Lamp Division, Bloomfield, N. J.; vice president, until September 30, 1945, **A. F. Wakefield,** The F. W. Wakefield Brass Co., Vermilion, Ohio; directors, until September 30, 1946, **A. D. Hinckley,** Columbia University, School of Engineering, New York, N. Y., and **P. M. Rutherford, Jr.,** Dallas Power & Light Co., Dallas, Texas.

In addition, the following regional vice presidents were elected for two-year terms ending September 30, 1945: **Leon Beauchamp,** The Solex Company, Ltd., Montreal, Canada; **Charles H. Goddard,** Pittsburgh Reflector Co., Pittsburgh, Pa.; **V. J. Graham,** General Electric Co., Dallas, Texas, and **Philip Peeples,** Georgia Power Company, Atlanta, Ga.

* * *

Frank C. Mahnke, Jr., has been appointed advertising manager for All-Steel Equip Co., of Aurora, Ill., manufacturers of A-S-E products. Although known the world over as manufacturers of steel lockers and office furniture, they are now devoting their facilities to the war effort. The War Production Board has again authorized the manufacture of steel Froz-n-Food Lockers in the interest of food conservation. Mr. Mahnke's background has been extensive in advertising and editorial work, and he comes to A-S-E with considerable experience.

* * *

Z. G. Taylor has been promoted to the post of manager of the huge East Cleveland (Ohio) Lamp Works plant, according to announcement made at Nela Park headquarters of General Electric Lamp Department. He will succeed **W. B. Gillen** who has been appointed manager of manufacturing for GE's newly formed Tube Division of Electronics Department embracing a large war plant here and in Buffalo. It was also announced that GE's Vacuum Tube Works, East Cleveland, will hereafter be called the Tube Development Laboratory.

Mr. Taylor, a native of Pennsylvania, has long been engaged in General Electric's lamp making activities as engineer and manufacturing executive. For several years, he was manager of the large Cleveland Lamp Works, after which he was appointed manager of the Jackson (Mississippi) Fluorescent Lamp Works.

Z. G. Taylor

Mr. Gillen, a native of Warren, Ohio, is a graduate of Ohio State University. He began working for General Electric in the Ohio Lamp Works plant at Warren while going to school. When East Cleveland Lamp Works was established in 1940, he was named assistant manager. He was promoted to manager of that plant on Oct. 1, 1942.

* * *

Effective August 15th, according to an announcement made today by **A. H. Nicoll,** Graybar president, **Charles S. Powell** is appointed manager of the Communications and Merchandising Department at headquarters offices in New York.

A. D. Hammond

Mr. Powell's place as district manager at Boston will be taken by **W. H. MacCrellish,** now district manager at Cincinnati. The new Graybar District Manager at Cincinnati will be **A. D. Hammond,** now manager at Birmingham. **Douglas Wallace,** now sales manager of the Communications and Merchandising Departments at New York headquarters, will become district manager of Pittsburgh on September 1st. **A. R. Loughborough,** now district manager at Pittsburgh, will retire on December 31st, after 39 years of outstanding service. Until that time, Mr. Loughborough will act in a consulting capacity at Pittsburgh.

* * *

A new division of the Appliance & Merchandise Department of General Electric Company to be known as the Resin and Insulation

Materials Division, has been formed with **E. L. Feininger** as manager, it is announced by **H. L. Andrews,** vice president in charge

E. L. Feininger

of the department. The new division will be responsible for the manufacture, engineering and sales of insulating varnish, glyptal, varnished cloth and mica products.

The transfer of responsibility for these activities from the Apparatus Department to the Appliance & Merchandise Department had been announced previously by **Gerard Swope,** president of General Electric.

C. K. Mead

Mr. Feininger has announced the appointment of **C. K. Mead** as sales manager, **C. S. Ferguson** as engineer, and **H. K. Collins** as superintendent. Accountant for the new division will be **E. T. Kilgore,** it is announced by **C. E. Anderson,** assistant comptroller of General Electric, with the approval of Mr. Feininger. The division will be headquartered in Schenectady, with the exception of Mr. Mead's sales operations which will remain temporarily in Bridgeport.

R. L. White, president of Landers, Frary & Clark, household appliance manufacturers of New Britain, Connecticut, has announced the appointment of **William James Russell,** former manager of engineering at Westinghouse, as vice president in charge of engineering for the Universal concern.

William J. Russell

Mr. Russell was born in Edinburgh, Scotland, on December 18, 1894. In Edinburgh he received his elementary and preparatory schooling then enrolled in Heriot-Watt Technical College to study mechanical engineering.

Before he completed his college course the World War intervened and he enlisted in the Royal Field Artillery. During the war he was wounded twice and gassed three times. For gallantry in action he was awarded the Meritorious Service Medal, the 1914 Star and two other service decorations.

He came to the United States in 1920 and for nine months he worked for the R & J Hoe Printing Press Company of New York assembling automatic devices.

In June, 1924, he entered the employ of the Westinghouse Electric & Manufacturing Company at its Springfield, Mass., works as a tool and die maker.

In January, 1932, he was transferred to the Westinghouse Electric Appliance Division, at Mansfield, Ohio, as supervisor of rates and tools. And in March, 1934, he was promoted to the post of manager of engineering in charge of all engineering and development work on electrical ranges, water heaters, irons, table appliances, roasters, dishwashers, and laundry equipment for the division.

NEW EQUIPMENT and MATERIALS

High Frequency Heating

Almost any non-metallic material can be heated uniformly throughout and in minutes where ordinarily it requires hours, with the new Thermex High Frequency Heating Equipment, manufactured by the Girdler Corp., of Louisville, Ky. Heating is accomplished within the article or molecule itself by reason of its molecular resistance to the high voltage, high frequency current passed through it from flat electrode plates covering opposite sides or top and bottom of the mass to be heated.

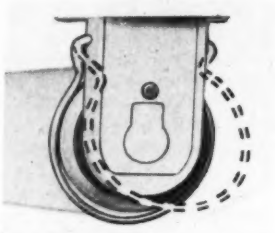
All coils, tubes, controls, etc., are housed with a compact safety cabinet, certain models of which are portable and mounted on casters. Any average-good workman can be trained to operate the largest units. Simplest units have single-knob control. equipment is extremely efficient in its transformation of electric current energy into heat energy, improves quality of product, increases production, simplifies auxiliary equipment and saves floor space.

Already thoroughly established in the wood-working or wood-fabricating field, where it is revolutionizing the processing of plywoods and lami-

nated woods used in airplane and ship construction, particularly, these heaters have many other successful applications: cellulose, paper, textiles, powders, felts, woolens, cottons, ceramics, clays, oxides, tobaccos, plastics, rubber, cork, glue, etc. Extensive, modern laboratory facilities are available for making test applications under simulated operating conditions, and large production facilities exist for manufacture. Write The Girdler Corporation, Thermex Division, Louisville, 1, Ky., for additional information.

Miller Safety Lamp Lock

The Miller patented safety lamp lock is an integral part of each socket of the new Miller Aero-Designed fluorescent fixtures. This device minimizes the risk of lamps



falling from sockets. Fool-proof under all conditions, it effects important savings in time and money in industrial plants. It prevents dangerous accidents, too. Simple in construction, it is arranged so as not to interfere with fixture relamping and cleaning.

Radiant Heat Drying Lamps

For drying, baking and heating processes, radiant heat drying lamps are recommended in a new illustrated booklet announced by Westinghouse Electric and Manufacturing Company.

The 12 page booklet tells what radiant heat is, and discusses its advantages: speed, low initial and maintenance cost, flexibility and ease of control, reduced space requirements. Besides discussing the design and performance characteristics of the drying lamp, the new booklet takes up the design of radiant heat installations, the arrangement and spacing of equipment, and electrical circuit design. Specific data is given for the three general classes of applications for industrial purposes; namely, evaporation of water or other solvents, paint drying, and increasing temperatures of materials to facilitate manufacturing processes. Formulas are stated for determining the wattage required

Finer Appearance— Better Performance

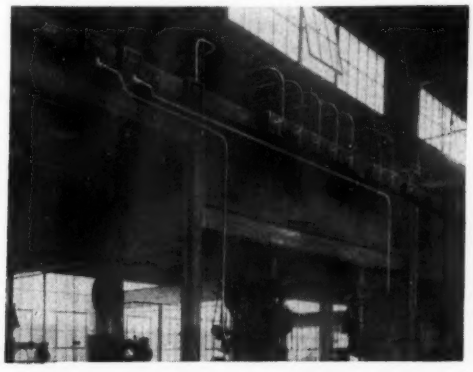
IN NEW LO-X *Ventilated* FEEDER BUS DUCT

Yet It Saves Much Steel and Copper In Conformity with WPB Limitation Order L-273

On Feeder runs, BullDog's Ventilated Type LO-X Duct puts more power through to branch circuits with less voltage drop. The screened casing not only improves appearance but prevents excessive heat—cuts weight—conserves a maximum of critical materials.

At the same time, Ventilated LO-X shares all the basic advantages of BullDog BUStribution Duct design. It is quickly and easily installed—has full asset value—is 100% salvable.

LO-X Ventilated Bus Duct for Main Feeders is available in the new WPB ratings of 800A, 1000A, 1350A, 1600A and 2000A. Single-phase, 3-phase, and 3-phase 4-wire; 600 Volts or less.

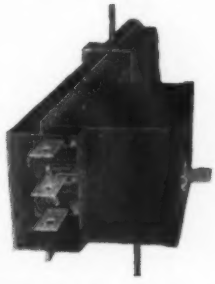


Flexible Light and Power

(Above) This shows a Branch Circuit run of BUStribution DUCT with circuit protective devices plugged in at points most convenient to the machines they energize and protect. Each 10-ft. section of plug-in duct has 10 outlets for the insertion of these plugs, which can be readily moved with the machines and instantly plugged in at any other desired location. It is 100% flexible and salvable.

Capacities available under new WPB standards are 250A, 400A and 600A for branch runs of Plug-in Bus Duct.

Plug-in Type for Branch Circuits



(Right) End view of a branch circuit plug mounted on a bus duct section. Note how the copper "contact fingers" of the plug, inserted through a plug-in opening in the duct casing, clamp over the busbars in the duct.

Wiring between plugs and machines is made in short runs of rigid or flexible conduit.

Plugs may be of the fusible switch type or automatic circuit breaker type and are readily interchangeable. Capacities: 30A to 600A; 600 Volts or less.

•

MANUFACTURERS OF a complete line of Vacu-Break Safety Switches, Panelboards, Switchboards, Circuit Master Circuit Breakers and BUStribution SYSTEMS.

BULLDOG
ELECTRIC PRODUCTS CO.
Detroit, Michigan

BullDog Electric Products of Canada, Ltd., Toronto, Ontario

Field Engineering Offices in All Principal Cities

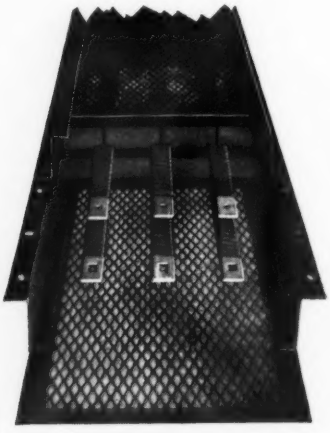
You SAVE when you SPEND on WAR BONDS

Illustrations show radiant heat drying lamps installed to heat pistons, dry glue on paper envelopes, reduce spoilage in a lithographing company, dry molds at a foundry, bake varnish on armatures, rotors, stators and field pieces at an electric refrigerator repair shop, and speed up production and reduce spoilage in other industries.

A copy of booklet A-3817 may be secured from the Westinghouse Lamp Division Bloomfield, N. J.

Feeder Bus Duct

A redesigned feeder bus duct of the Ventilated Type, having a screened casing of expanded metal in place of the solid metal casing formerly used, has been announced by the BullDog Electric Products Co., of Detroit, Mich.



While conserving the utmost in critical steel and copper, it is claimed that the new design is more attractive in appearance and provides better performance as the complete ventilation afforded by the screen casing assures low operating temperatures and increased current carrying capacities. The paired-phase bus bar arrangement within the casing assures uniform current density through reduction of "skin effect" and "proximity effect".

The new feeder bus duct is available in the new WPB ratings of 800, 1000, 1350, 1600, and 2000 amperes single phase, 3 phase, and 4-wire 3-phase, 600 volts or less.

It can be used for feeders alone or in conjunction with the company's branch circuit Plug-in Type BUS-tribution duct.

Acme Air Cooled Transformer

"Power Where You Need It," a new bulletin issued by Acme Electric & Mfg. Co., of Cuba, New York, outlines and gives examples of air cooled transformer applications in war production industry.

The bulletin also describes in detail the various types of air cooled transformers manufactured by this company, and lists the complete range of 55 degree ratings in auto type, two winding type, three winding type and four winding type transformers up to 50 kva.

Varnish Solvent Chart

A new free solvent chart for reducing benzine solvent varnishes is now available by writing to the John C. Dolph Company, 166 Emmett Street, Newark, 5, New Jersey. This solvent chart may be used for reducing varnishes from 350°Beaume (0.849 specific gravity) to as low as 20°Beaume (0.933 specific gravity).

The chart is very simple to use. With the aid of a thermo-hydrometer, find the specific gravity of the varnish and then locate the reading at the top of the solvent chart. On the left side of the chart is a scale indicating the desired gravity. The point where the two meet indicates the number of gallons of thinner to be added in order to achieve the desired gravity for each 100 gallons of thinner to be added in order to achieve the desired gravity for each 100 gallons of varnish.

Trumbull Control Centers

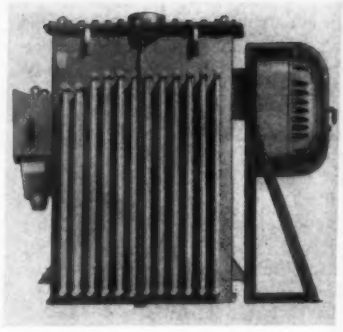
The Trumbull Electric Mfg. Company, of Plainville, Conn., has just issued a circular describing and illustrating their line of control centers, including motor control centers and switchboard control centers.

This literature brings up to date information on these control centers, which consists of vertical sections containing bus bars, into which are plugged combination control units of magnetic starters and disconnects, sizes 1, 2, 3, and 4, and switch and circuit breaker control units 30 to 600 ampere.

All these units are standardized and prefabricated—saving engineering time in layouts, conserving space, and reducing installation and operating costs. A copy of this bulletin gladly sent on request.

New Load-Center Unit

A line of load-center unit substations for semihazardous locations in oil refineries chemical plants and other plants having similar conditions, has been announced by the General Electric Company. Available in standard ratings from 100 to 1000 kva at 480 volts and 100 to 500 kva at 208/120Y or 240 volts, these unit substations can be used indoors or outdoors for power and lighting service of 600 volts and below. Primary voltages from 2 4 to 15 kv can be handled.



The new line incorporates a liquid-filled primary disconnecting switch, standard Pyranol or oil-filled transformer section, and a low-voltage section with a 600-volt, easily removable air circuit breaker. The units are completely metal-enclosed, coordinated, factory-built substations. All arcing parts are either liquid immersed or in enclosures of "Class I, Group D," construction.

The transformer has four 2½-per cent taps (two above and two below normal-rated high voltage, and for rated kva) in the high-voltage winding. An externally operated, manual tap changer is furnished for operation only when the transformer is deenergized.

The incoming line switch is mounted integral with the transformer section and is equipped for breaking transformer magnetizing current. A key-type interlock works in conjunction with a similar lock on the low-voltage breaker to prevent the switch from being operated when load is on the transformer.

The low-voltage section is furnished with either a manually or an electrically operated main secondary air circuit breaker with time-overcurrent protection and instantaneous short-circuit trip. The circuit breaker is mounted in a Class I, Group D, metal enclosure. Bulletin GEA-4085 describes this equipment in detail.

Two-Terminal Oil Capacitor

Already a highly popular type of oil capacitor because of its handy inverted screw mounting and compact dimensions, the Aerovox Type 10 is now further improved by the new double-terminal feature. Heretofore, this capacitor has had a single insulated terminal and grounded can, although when screw-mounted on a metal chassis it could be fully insulated by an insulating washer.

The new double-terminal feature means that both terminal lugs are insulated from the "floating" can and no insulating washer is required. These capacitors, made by Aerovox Corporation of New Bedford, Mass., are hermetically sealed and will pass

UPTEGRAFF

distribution TRANSFORMERS

Uptegraff

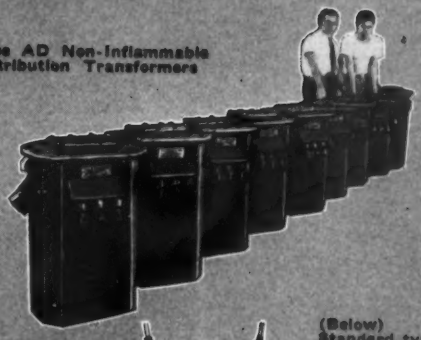
The Time, the Type *and* the Capacity

Over the engineering boards and into production on schedule, your Uptegraff Transformers are shipped to you "as promised" with remarkable certainty.

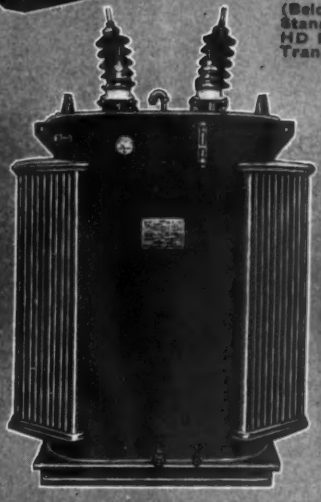
Into the design go all the "important little things" that are the distinguishing marks of "Quality and Service" in Uptegraff Transformers—the promise that in the time to come on the job you will get years of service stretching far beyond normal expectancy.

Our forces and our plant are today equipped better than ever before to deliver, and deliver on schedule, any and all the types and sizes of Transformers that characterize this line of "Quality and Service" Transformers.

Tell us what you want, when you want it, and see us meet your requirements.



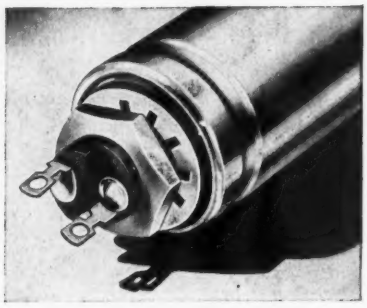
Type AD Non-Inflammable Distribution Transformers



(Below) Standard type HD Distribution Transformer

Type UD Distribution

R·E·UPTEGRAFF MANUFACTURING CO·
SCOTTDALE PENNSYLVANIA U·S·A·



all immersion tests required by Governmental agencies. This is accomplished by the use of the new one-piece molded bakelite terminal assembly which prevents penetration of moisture and leakage of oil.

Available on high priorities only, these capacitors are filled with either Hyvol vegetable oil or mineral oil, rated up to 4.0 mfd. at 600 v. D.C. and to .5 mfd. at 1500 v. D.C. The can, similar in design and dimensions to the usual inverted-screw-mounting metal-can electrolytics, is of aluminum or an approved substitute.

Localized Lighting Unit

Illumination engineers know that localized lighting units are essential for industrial operations where critical machining, inspection and assembly are performed. Likewise have they determined that in some instances the fluorescent type of localized unit is more desirable because of the soft non-glare character of this type of light.

To provide such equipment for industrial critical work areas, the Fostoria Pressed Steel Corporation, of Fostoria, Ohio, has designed a model which provides the proper quantity and quality fluorescent light for certain operations.

The reflector head of this model, called FLB, weighs only 3 lbs. and uses a minimum of critical materials. Housing is 22 gauge steel. Reflector of non-metallic is 15-1/16" long, 9" wide, and 5-5/8" high. The unit accommodates two 14-watt fluorescent lamps. It is equipped with lamp ballast and comes completely wired with switch mounted on top of the housing. In excess of 100 footcandles is provided for the critical work area by this model.

Outside finish is wrinkle gray; inside reflector finish gloss white. A variety of arm lengths are available for positioning requirements.

New Type Ballast

The new model 240 B Streamliner manufactured by Superior Electrical Industries, 2614 West North Avenue, Chicago, Ill., has a patented feature that balances the light output and power consumption of two fluorescent lamps, 90° out of phase. The Streamliner is especially light in weight—weighs two pounds less than brick type ballasts. In addition to this

reduction in weight, the streamlining of the ballasts permits easier installation in the ballast channel of the fixture. This ballast has an inductance of advanced design, therefore lamps are correctly balanced. It reduces the stroboscopic effect, thus eliminating eye strain and, at the same time, providing a more pleasing and more comfortable lighting effect. Further information may be obtained by writing to the manufacturer.

Latching Wire Clamps

New wiring harness clamps with a latching finger have been released for use in aircraft and other equipment. These clamps work independently of the attaching screw in the assembly of wire harnesses. Any or all of the wires may now be removed or replaced without even loosening the screw that holds the clamp in position. These clamps are used in place of "boggles" at the point of make-up. They remain snapped over the wires during transportation to final assembly location and then serve as the mounting means for attaching harness to structure. Made

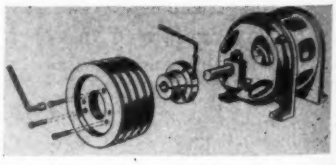
of spring steel parkerized and given 2 coats of lacquer, they are cushioned with extruded synthetic rubber channels having integral resilient ribs to absorb variations in thickness of harnesses. Two different latching stations are provided on each clamp for size adjustment to fit varying number of wires. With the resilient ribs and the adjustment feature, 6 sizes accommodates wire bundles varying from 1/16" to 1 3/8" in diameter. They are manufactured by Tinnerman Products Inc., 2124 Fulton Road, Cleveland, Ohio.

Quick Detachable Sheaves

The new Pyott QD (Quick Detachable) Sheaves offer important advantages to both the manufacturer and user of machinery employing multiple V-belt drives.

The ease, speed and absolute safety with which the Pyott QD Sheave is attached to or removed from the shaft is its outstanding feature. A socket wrench is the only tool needed for either job. The accompanying illustration shows the simple steps involved in attaching sheave to shaft.

First step is slipping the tapered, split Pyott hub onto the shaft in line with the keyway. Then the headless cap screw shown is tightened down with an inserted key, clamping the hub firmly on the shaft and producing a virtual press fit, even on undersized or oversized shafts. Next step is attachment of the QD Sheave



on the tapered hub. Actual tightening of the sheave on the hub is accomplished by inserting the pull-up bolts shown in the illustration and tightening them evenly with a socket wrench. These bolts protrude through the sheave and engage with threaded holes in the hub to form an immovable union.

Pyott QD Sheaves are available in standardized QD sizes which, in spite of the important advantages they offer, are priced as low as regular standard sheaves. Full information

Advertisement No. 6

In ten more minutes what will you be doing?

IN TEN MORE MINUTES they'll be in action—American fighters risking life and limb to conquer one more bridgehead on the road to freedom.

And in ten more minutes—what will *you* be doing to help win this war?

Because it's up to you as much as it's up to them. Unless you—and all the rest of us at home—are devoting every spare minute of our time to fighting this war as civilians, *their* chances of victory are slim.

Next time you read of an American raid on enemy positions—with its tragic footnote of lost planes and ships and men—ask yourself:

"What *more* can I do today for freedom? What *more* can I do tomorrow that will save the lives of men like this and help them win the war?"

* * *

To help you find *your* place in America's War for Freedom, the Government has organized the Citizens Service Corps as part of local Defense Councils. Probably there is one of these Corps operating now in your community. Give it your full co-operation. If none exists, help organize one.

Write to this magazine for a free booklet, "You and the War," telling you what to do and how to do it. This is *your* war. Help win it. Choose what you will do now!

EVERY CIVILIAN A FIGHTER

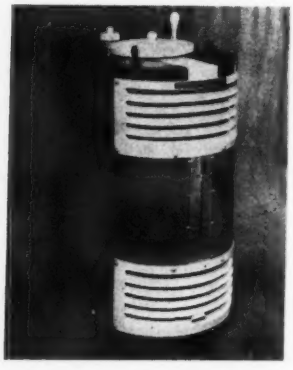
Contributed by the Magazine Publishers of America

is available in the new Pyott QD Sheave Bulletin which may be obtained on requests addressed to the Pyott Foundry & Machine Co., 328 North Sangamon St., Chicago, Ill.

New Outdoor A-C Welder

A new 500-ampere outdoor alternating-current welder has been announced by the General Electric Company. The new welder, which has a welding current range from 100 to 625 amperes at 40 volts, is especially designed for use in shipyards and other outdoor locations where exposure to the weather is encountered.

A desirable feature of this welder is an "idlematic" control which automatically reduces the output voltage to less than 35 volts whenever the arc is not in operation, but provides full power for welding the instant the arc is struck. This control also includes a switch operated by a handle extending through the top of the case for starting or stopping the welder manually.



The welder is protected against the entrance of rain, snow and sleet by dripproof construction of all openings in the top of the case and by a sealed window over the current indicator. Wide louvers serve not only to shed water but to keep air velocity low. All internal parts have a special finish for protection against corrosion from moist air.

In addition, the welder is provided with all the desirable features incorporated in General Electric indoor a-c welders of this type. These include built-in power-factor improvement which provides low current input by maintaining the power factor at 95 per cent or better at all loads between 40 and 70 per cent of rating. They also include fingertip adjustment, stepless current control, fan-forced ventilation, and capacity for operation with long leads.

Further information can be obtained by writing General Electric Co., Schenectady, New York.

Additional Restrictions On Electrical Conduit

(*Continued from page 46*)

metal used in the manufacture of heavy wall conduit and in raceways is restricted to 1/10 and 1/8 respectively of the total weight of metal used for these items in 1941.

The amended order also makes the following changes:

Prohibits for all items covered by the order the manufacture of sizes greater than the minimum sizes permitted by the 1940 edition of the National Electrical Code.

Tightens restrictions on permitted uses of heavy and thin wall conduit by exempting installations in "wet locations" as defined in the 1940 National Electrical Code instead of in "damp or wet locations."

Exempts heavy and thin wall conduit used to suspend industrial lighting fixtures weighing 4 pounds or more from specified restrictions on manufacture and installation.

Limits sale by manufacturers of all items covered by the order to purchase orders with preference ratings of A-1-j or better. (Formerly only distributors sales were restricted to those with rating of A-1-j or better.)

Permits sales from one manufacturer to another and from one distributor to another without preference ratings in order to balance stocks.

Permits extension of ratings for heavy wall conduit to an equal amount (in linear feet) of thin wall conduit of the same size, and vice versa.

Imposes specified restrictions on the installation of raceways.

Restrictions on manufacture are effective July 1, 1943; restrictions on installation of raceways are effective July 9, 1943.

How To Conserve Transformer Life

(*Continued from page 32*)

Self-Cooled Air-Blast—The thermostatic air-blast control element is shipped with the adjustment set to place the fans in operation when the oil temperature reaches approximately 60° C or 65° C. There are two variable factors which can be adjusted. The first is the oil temperature at which the contacts close and the second is the drop or differential below this temperature at which the contacts open. The setting of these adjustments will depend on the nature of the transformer loading. With extreme changes in ambient temperature it may be found necessary to change the operating point to compensate for these changes. If it is found that the fans start and stop frequently or tend to "chatter" the differential should be increased.

Fan motors should be greased periodically. The more recent fan motors require much less greasing than the type used earlier. Excessive greasing must be avoided to prevent the greases from being forced into the motor. The fan motor housings should be painted with the same frequency as the main transformer. Where bolted-on assemblies are used, these should be checked periodically for tightness.

Water-Cooled Transformers Occasionally the quality of the water used for cooling purposes is such that it will gradually form a deposit inside the cooling coils. This will tend to increase the transformer operating temperature either by restricting the flow of water or by increasing the temperature drop between the hot oil and the cooling water. Even a relatively thin layer of scale can greatly increase the temperature drop between the water and the oil. A higher operating temperature or restricted flow of cooling water should therefore call for a check of the cooling coils. If the trouble is caused by a deposit of dirt it can be removed by blowing through the coil with live steam. If there is a deposit of scale, it can usually be removed by passing a 10% solution of hydrochloric acid through the coils.

In cases where there is appreciable sludging of the oil, a deposit of sludge is often formed on the outside of the cooling coils. Here again this results in higher operating temperatures and the sludge should be removed, preferably by washing with hot oil.

It is essential in a water-cooled transformer that the water be kept flowing continuously. Alarm circuits should be wired to indicate when the flow of water drops below the value given on the instruction plate. When parallel sections of cooling coils are used in the same transformer care must be taken that each section receives its share of the cooling water

Salt water or highly acid water must never be used in cooling coils.

If there is any suspicion of a leak in the cooling unit it should be tested. To do this connect a pressure pump valve and pressure gauge to one end of the coil in the order given. Pump water into the coil or transformer oil if the coil is already in the transformer tank and when full close up the open end tightly with a cap, being careful to leave no air pocket. Bring the pressure up to about 100 or 150 pounds per square inch by means of the pump and close the valve tightly. If all connections are tight and there are no leaks in the coil, the pressure should hold practically constant.

(1) *Emergency Overloads for Oil Insulated Transformers* by F. J. Vogel and T. K. Sloat, Electrical Engineering, September 1942.
(2) *Hot Spot Winding Temperature in Self-Cooled Oil-Insulated Transformrs* by F. J. Vogel and Paul Narbutovskih, Transactions AIEE, March 1942.
(3) *Loading Transformers by Copper Temperature* by H. V. Putman and W. M. Dann, Electrical Engineering, October 1939.

Servicing the Refrigerator

(*Continued from page 23*)

short differential (4 degrees to 8 degrees). However, if the control is attached to the coil and reacts to coil temperature, a control with a long differential is desirable (14 degrees to 20 degrees).

Application Check List

Before applying any control to an installation, the following list should be checked.

(1) *Is the equipment right for the job?* Good controls will help but will not correct poorly applied equipment.

(2) *Is the proposed control system the simplest one that will perform the necessary service?* It is possible to go wrong either way here. If too complex a control system is used, the installation will be expensive and the very complexity of the layout will be a source of service trouble. On the other hand, if too few or the wrong controls are used, the temperature of the refrigerated space may vary unreasonably, coils may frost up permanently, the failure of one control may be the cause of spoilage of a large quantity of produce, etc. — with consequent service trips and the loss of customer good will.

(3) *When installing a thermostat, will the temperature at the con-*

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SALES OPPORTUNITIES

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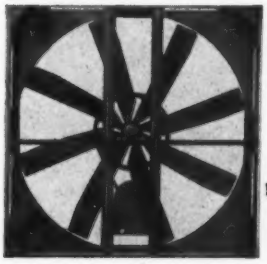
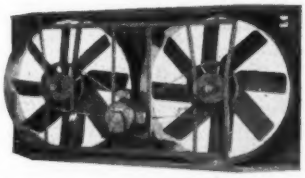


Exhaust FANS and BLOWERS in YOUR territory!

UNDER CMP REGULATION 5 which permits minor capital expenditures on additional equipment and plant improvement, hundreds of manufacturing and processing firms in your territory can now assign their own priority rating to orders for Coolair Fans . . . to properly ventilate and lower temperatures in workrooms and processing spaces in their plants.

Contact the right men in these plants and sell them on Coolair Breeze-Conditioning as the simple and economical way to maintain high employee efficiency during the hot summer months and at the same time help reduce absenteeism by improving working conditions.

If you find that their needs exceed the limit of expenditure authorized by this regulation, help them prepare and file application on Form PD-1A with your nearest WPB Field Office for quick action.



TWIN UNIT FAN: Widely used where limited headroom or vertical wall space does not permit use of adequate sized single unit Coolair Fan.

PROMPT SHIPMENT . . . can be made on many types and sizes of Coolair Fans on orders bearing a rating of AA-5 or better.

Call on us if we can be of help in working out difficult problems in ventilating and lowering summer temperatures.

A full description of the Coolair line, with tables showing models, dimensions, performance data, etc., can be found in
SWEET'S CATALOG A.S.H.V.E. GUIDE
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AMERICAN COOLAIR CORPORATION
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trol switch be different from the temperature at the control bulb? Is the thermostat designed to take care of this difference?

(4) *When installing a low-pressure control, is the condensing unit in so cold a location that the control will not operate properly?*

(5) *When installing a high-pressure cut-out, is the control line to the compressor head free from any valves that might possibly be shut off?* (A small diameter line between the compressor head and the high pressure cut-out, reduces the effect of compressor pulsation against the high pressure bellows minimizing the chance of a bellows failure.)

(6) *Does the horsepower and voltage of the motor, exceed the maximum rating of the Underwriters for the control?*

(7) *Is the range of the control correct for the application?* Some of the older high-pressure cut-outs cannot be adjusted high enough for use with Freon-12. Thermostats and low-pressure controls are built in several different ranges for different types of application. For example, one model thermostat is built in the following ranges: —15° to 40°, 30° to 80°, 50° to 100°. It should be noted that this is a constant cut-in control and therefore the ranges given are the cut-in ranges. Controls should be selected so that the expected temperatures or pressures fall well within the range of the control and not at one extreme or the other; then there will be plenty of adjustment if it is needed.

(8) *Is the differential correctly set?*

Control Settings

After a control has been installed, there comes the problem of setting it to maintain the proper temperature in the refrigerated space. When the conditions of the installation are known, the best practice is to set the controls in the shop before going out on the job. The temperature of the refrigerated space is checked by placing a thermometer at some position where it will indicate average temperature for the entire space. Readings taken at cut-in and cut-out will make it possible to adjust the controls accurately. An invaluable instrument for this purpose is a recording thermometer.

Low-pressure control settings should be checked by a thermometer in the refrigerated space, but are originally made by reading a compound gauge assembled to the compressor suction service valve. High-pressure cut-outs are set by reading a high-pressure gauge assembled to the compressor discharge service valve. The discharge pressure can be raised high enough to check the cut-out setting by blocking the air flow through an air-cooled condenser or by shutting off the water flow through a water-cooled condenser. Always make this test — just as you would test any other safety device.

Taxes a Year-Round Problem from Now On

(*Continued from page 18*)

1943, then it is up to you in 1943 to see that net profit is at least $1,800. Whether you make it or not, you should work toward that objective. If it runs less, the unabsorbed portion cannot be carried over to the third year and you lose credit for the difference.

This shows clearly that you can't forget your income tax throughout the year, that it is now so closely entwined with operations that you must consider it an element of month-to-month operating routine.

Certain expenses, such as advertising, must be viewed in the light of tax deduction. For example, if a contractor's net taxable income under the 1942 rates is $5,000, the net cost of $50 worth of advertising would be about $40. If he didn't spend the $50 for advertising, he would have to pay the differential in tax. A contractor with $15,000 net income who spent $500 for advertising would get it for about $350.

This also applies to manufacturers selling the electrical field. Under the high rates, the cost of advertising is greatly reduced. Other expenses may be regarded in the same light. Figure the net cost of outlay after deducting the tax to appraise value received. An odd way to figure, you say. Brother, you'll have to revise a lot of your figures and opinions to ride the duration and post-war periods!

The computation of selling prices may undergo change in the future. The usual procedure has been to consider the cost of sales and overhead expense first and build the selling price from there, either on a mark-up on cost or margin on sales formula. On estimates, you figure labor and materials, then add a percentage for overhead and net profit. Henry Ford has reversed his formula. His success indicates there may be something good in the idea, even for electrical dealers or contractors. At any rate, it is food for thought. As Ford explains it, "My policy is to reduce the price, extend the operations, and improve the article. You will notice that reduction of price comes first. I have never considered any costs as fixed. Therefore, I first reduce the price to the point where I believe more sales will result. Then we go ahead and try to make the price. The new price forces the costs down."

Henry Ford was manufacturing cars, which differs from selling or installing electrical goods, but we quote him because high taxes, economic changes and governmental regulations may compel all businesses to follow this formula in days to come. Business men with traditional leanings may find the "bugs" in this system but they are thinking in terms of existing practices and set-ups, which must be revised or remodeled entirely after the war to keep income and employment at peak.

To pay for the war, we must "up" income, at least to 200 billion dollars yearly in the post-war period, and under a normal peacetime economy, income never exceeded 80 billion dollars annually, according to reliable statisticians. Many contend that a volume of 200 billion dollars or more cannot be obtained in post-war years unless prices are reduced all around and this may compel a change in pricing formula to approximate Ford's method.

Obviously, if national income can be stepped up to more than twice its normal peace-time level, the tax rate can be reduced for each business man because, given a fixed budget, the pro-rata tax will be halved if the income is doubled. So, the revised method of costing may cut your margin because it brings down prices but it will also cut your tax and probably provide a bigger gain in that way.

The income tax laws are so full of Gremlins that discussion never clarifies. Amendments have followed amendments, willy-nilly, court decisions have twisted the

original intent of legislators, the Tax Board of Appeals has handed down hundreds of rulings interpreted in many different ways, even on similar cases, rules and regulations have been piled on top of each other so that the ensemble is a hodge-podge of inconsistency, saying nothing about indirect taxes and other direct levies, Federal and State.

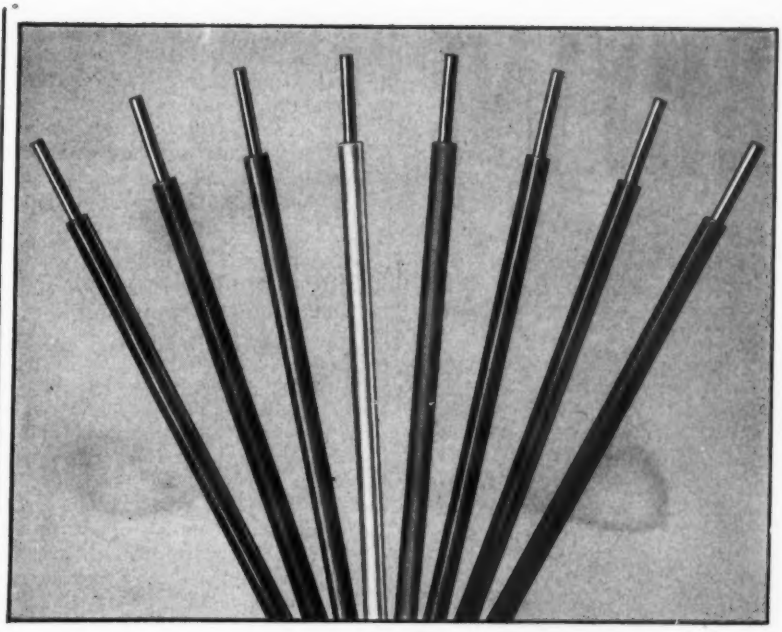
This is probably the reason why there is always so much argument anent tax, but, like Mark Twain's weather, nobody ever does anything about it. Tax has grown wild in our economic field, creating business erosion, destroying instead of cultivating income because it is unscientifically administered — and the Frankenstein is getting beyond control.

Electrical contractors or dealers, as a class, have never bothered much about the soundness of our income tax laws. Up to now, they were interested only in the tax they had to pay, but from now on, the wise taxpayer will acquaint himself, not only with the tax in dollars, but consider it as it affects his internal operations and external economic conditions, the latter indirectly vital to his well-being.

Many contend that the taxation system should be revamped, the Federal government to preempt the income tax fields, with a percentage of restitution to the States, likewise, the excise tax field. Preferaby, one flat rate, including income tax, social security, Victory tax, unemployment insurance and probably other Federal levies instead of the cumbersome payments and computations now in effect.

Of course, this is war and we must pay for it but the rates are now so high, the computations so complex, inequalities so unfair, interpretations so vague in many cases, borderline situations increasing whereby a transaction may be interpreted in more ways than one, that the present tax laws defeat their purpose, leaving business men bewildered and initiative crippled so that the ability to pay may be considerably lessened.

As we said at the beginning, tax is now a major expense, and must be kept in mind throughout the year. You must study and analyze your operations in relation to the tax rates and regulations, otherwise, you may find yourself in a



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FOR MAINTENANCE WIRING
FOR NEW WAR WIRING AND REWIRING

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Flamenol's small diameter enables more wires to be used in conduits. Its smooth finish makes wire pulling easy. Its insulation is superaging, high in dielectric and mechanical strength, flame retarding and resistant to oils, moisture, acids, etc. Use it for branch circuits, feeders and special wiring. It is available in sizes 14 to 4/0.

For further information see nearest G-E Merchandise Distributor or write to Section W634-16, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

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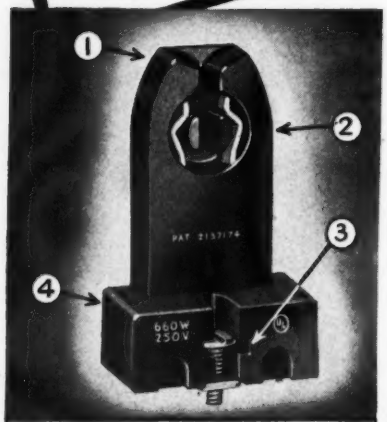
FLUORESCENT LAMPHOLDER NO. 4300



Ease of Replacement is a Feature of This Lampholder

1. Slot-finding feature facilitates replacement of lamps.
2. Heavy spring contacts hold lamp firmly and provide positive electrical connection.
3. Slot for mounting screw or nut makes it possible to mount lampholder with maximum reflector clearance.
4. Body made of rugged bakelite. Choice of black or white.

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BRYANT — SUPERIOR WIRING DEVICES

bad way regardless of how efficiently you manage your business.

It is also advisable to contact your Washington representatives, make them understand that you are taking a more critical interest in the subject so that they will remodel the tax laws to eliminate the "bugs" that short-circuit business operations and profits.

Motor Shops Keep War Plants Operating

(Continued from page 16)

suddenly finds its wiring system overloaded. The problem is to remedy the situation and, at the same time, keep the plant operating.

Under such circumstances, the formula is usually to put in additional wiring circuits. The additional feeders lessen the load on existing circuits and at the same time allow for plant expansion. Usually safety switches are used as time does not permit the design of a switchboard which would fit the job, and besides, it might not be needed after the production pressure of the war is over. The individual safety switches thus offer a more flexible arrangement. Usually, new wiring is placed in conduit and old wiring cleaned up where piecemeal extensions have been made.

Among the wiring jobs done by this concern was one for a plant where 75 welders were to operate in one room. It also wired an old commercial building in which was placed about 100 electrically-operated sewing machines by a company making parachutes.

This concern also handles new construction work with Tom W. Atkinson, electrical engineer, being superintendent in charge. A complete electrical system was recently installed for Southern Steel Works Company, manufacturers of bombs and floating drydocks for the U. S. Navy. The steel company built a complete new plant in the city to handle these contracts. The wiring for the several acres of operations is said to be of the latest design but a number of reconditioned motors and electrical apparatus was used on this job. This was because new ones could not be obtained without considerable delay and the steel plant was in a big hurry to get in operation.

The Birmingham Armature-Electric Company's new plant is 35 by 140 feet in size and is equipped for rewinding, rebuilding and repairing all types of electrical power apparatus such as motors, generators, field coils, armatures, commutators and transformers. Much of this work is under the direction of D. B. Howell, shop superintendent.

A complete "rebuild" service on small motors from fractional horsepower, single-phase and three-phase, five horsepower, is offered by the company. This new department is under supervision of D. E. Burns. In its new home, it was necessary for the concern to design some of its own equipment to take care of its increased work during the emergency as new machines cannot be obtained readily. One piece of equipment built in the shop is a coil winding machine.

Another service rendered during the Spring season by this concern was the reconditioning of electric fans. This type of business is not solicited on account of the shortage of help, but the service was extended more or less as a courtesy to industrial concerns for whom motor rewinding and wiring jobs were being done.

Maintenance for a Modern Dairy

(Continued from page 13)

with thermal-action cutouts as an automatic protection against overload. Approximately 90% of the motors employed in the plant are of moisture-resistant construction.

It might come as a bit of surprise to electrical men unfamiliar with dairy operation to see a motor resting on a concrete surface over which water is flowing to a depth of ¼-inch or more. Yet, those are the conditions under which three motor-driven pump units have to be used. Powered by ½ hp sealed motors, this equipment is utilized for pumping milk from one vat to another.

Motor and pump form a single portable unit which regularly is moved from one portion of the processing department to another. Grounded to the wet floor by two metal, ball-shaped feet at one end and a metal frame-support at the other, these motors are connected to feed lines by water-resistant cords plugged into shoulder-high wall receptacles.

The dairy has many special electrical installations designed to

save time or to protect some processing operation. Some of these devices are factory-built, while others are of home manufacture. Among the latter are two signaling contrivances.

One of these rings a bell in case a 1¾ hp motor, powering agitators in two 3,000-gallon raw milk tanks, is switched off accidentally or otherwise. If the agitators are stopped, milk going to the pasteurizers would not be of uniform cream content.

A second device sounds a gong if a power-interruption stops the motors which operate the pack-ice machine. The warning allows sufficient time in which to shut off the compressor-line suction valve, thus preventing a "freeze-up" requiring the better part of an hour to defrost.

Among the factory-built electrical trouble and time savers previously mentioned are a thermal-action micro-magnetic switch, forming a part of the plant's pasteurizing equipment, and an electric time-clock controlled cold-room defroster.

The micro-magnetic switch governs a flow-diversion valve. Should milk undergoing pasteurization fall below the proper temperature, the switch working under thermal influence automatically operates the valve, thus returning the fluid for reheating.

The electric clock which controls defrosting governs not only the time but also the duration of the operation. At a set time, the clock shuts off the ammonia supply and turns on the defrosting mechanism. The latter consists of a motor-driven fan, fin-and-coil assembly, and a 5,000-watt nichrome heating element. In a room at -10° F, the defrosting time is twenty minutes.

The "pack ice" machine mentioned turns water from melted ice into "slush" from which the water drains into a catch basin, leaving dry "snow" used to keep bottled milk cool while being delivered. Two 2-hp motors power pumps which deliver the "slush" to receiving bins and return the drained water to the machine. A third motor of 3 hp motivates the ice-making unit.

Motors do many other jobs around the plant. They power three compressors, pump from a driven well water used for washing floors and feed fuel oil to the dairy's boilers.

"Hot Pilot"

Enjoying a well-earned rest, smoke, and breath of cool air, this Navy pilot has just returned from an attack on a Jap airport. This morning he'd have laughed if you had called him a "hot pilot." But right now he'd agree enthusiastically, for flying in the humid Southwest Pacific is sweaty, dirty, *hot* work. And he might be called back to it on a moment's notice.

Easing his physical and nervous strain is just one of the needs that keep our entire wartime output of R & M Fans reserved for ventilating jobs essential to the war program. These famous breeze-makers are also helping Army and Navy doctors do their best work by keeping the air fresh and invigorating, and are helping wounded fighting men recover faster by making their convalescence more comfortable on shipboard and in hospitals.

Now you know why there'll be no R & M Fans for *civilian* use, for the duration. And we're sure you're *for* it, one hundred per cent!

★ ★ ★

▶ If you need repair parts for R & M Fans—or want complete repair jobs done *for* you—get in touch with us, or the nearest R & M branch office listed below.

ROBBINS & MYERS INC.

SPRINGFIELD, OHIO • Branch Offices in:

NEW YORK, 200 Varick St. CHICAGO, 2400 W. Madison St. PHILADELPHIA, 401 N. Broad St.
KANSAS CITY, B. M. A. Bldg., Room 325, 215 Pershing Rd. SAN FRANCISCO, 237 Rialto Building
NEW ORLEANS, 116 Arlington Dr. DALLAS, 1100 Cadiz St.
THE ROBBINS & MYERS CO. OF CANADA, LTD., Brantford, Ont.

This advertisement does not imply endorsement of our products by the armed forces.

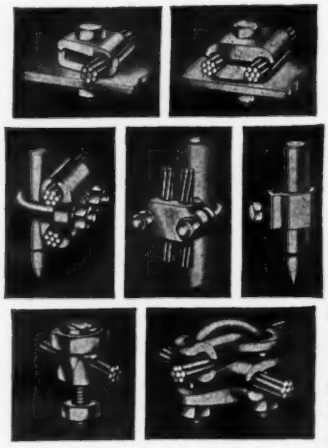
"You can get ANY Grounding Connector—

—in the COMPLETE line."

The pictures below can only give you an idea of the variety, because **Penn-Union makes ALL good types.**

Write us for any grounding connector, clamp or stud . . . for all combinations of pipe, rod, flat bar, cable, braid, tubing.

Every one a *dependable* unit of protection for personnel and equipment . . . of ample capacity, high mechanical strength, and resistant to corrosion.



Also the most complete line of Service Connectors, Cable Taps, Terminal Lugs, Tees, and other fittings. *Penn-Union connectors are the choice of leading utilities, industrials, contractors and electrical manufacturers.* Write for Catalog.

L. MORRIS LANDERS
309 Walton Building Atlanta, Ga.

WALTER J. HUEMMER
Dallas Transfer & Terminal Warehouse Building Dallas, Texas

PENN-UNION ELECTRIC CORPORATION
ERIE, PA.

PENN-UNION
Conductor Fittings

The burden of maintaining the plant's electrical equipment falls on George Moore, chief engineer, and one assistant. These two take care of much of the dairy's processing equipment as well. The remainder of the plant's mechanical maintenance is handled by a night engineer and a three-man crew.

Although, as stated, much of the electrical apparatus was selected from the standpoint of minimum upkeep, it has to have routine care. In order to put the latter on a systematic basis, Moore set up a schedule which assigns the inspection and needed servicing of a portion of the plant's motors to a definite day of the week.

For example, on Sunday sixteen cheese-room motors ranging from a fraction to 5 hp are inspected. On Monday, twelve processing-room motors varying from 1½ hp to 20 hp are serviced. Thus, by following the schedule, in the course of a week's time the sixty-seven motors listed receive routine attention.

All but a small percentage of the motors in use are of ball-bearing type. For these, Moore employs a special grease (Luberplate), which he has found to be highly satisfactory in respect to both lubricating and lasting qualities. By use of this lubricant, he has found that motor lubrication may be done at not-too-frequent intervals. Moreover, his experience has convinced him that the over-greasing of electric motors is a maintenance sin more often committed than under-lubrication.

Stand-By Pumps on Rollers

The dairy has several spare motor-and-pump combinations intended as "standbys" for use in case regular installations fail to function. Some of these units are adaptable for use with more than one piece of processing apparatus. Mounted on castor-equipped metal platforms, the "standbys" quickly may be moved to any desired part of the plant. However, Moore claims that since the dairy has occupied its present quarters no need for any of these spares has arisen.

And, thanks to foresighted planning in the choice of its electrical equipment, Home Milk Producers has experienced no serious power failure since these installations have been in use.

Intensive Salvage Program Urged

(*Continued from page 11*)

tives of a utility company, learns of items of materials or equipment which he believes should be scrapped, and receives the answer that the material had been listed with the Power Division over a period of many months, but that no direction relative to disposition had been received.

I believe that complete cooperation between the public utility representatives of Industrial Salvage Branch and the regional engineer in charge of utility inventory control and the Salvage executives of the various companies can completely obviate this condition.

On questionable items, a check should first be made with the Utility Inventory Control Engineer regarding the need of the material somewhere in the industry. If such a need is not found to exist, and no limitation order is involved, as I understand it, you are free to exercise full discretion in the matter. I know from

IN THE Atlantic

the more war bonds you buy... the safer will be our supply lines to fighting fronts ...so buy more!

IN St. Louis

the better you rest at night... the more efficient you'll be next day... so stop at

HOTEL Lennox
EVERY ROOM AIR CONDITIONED... NOISE PROOFED FROM $3.00

your past performance, that you will lose no opportunity to contribute needed scrap materials to the mills and refineries for refabrication.

Since last August, I have had the privilege of serving as chairman of the subcommittee on Conservation of Materials for the American Institute of Electrical Engineers. This committee has assembled some information coming to its attention, examples of things that have been and are being done by the electrical industry to conserve critical materials. The information is obtained from many sources. The committee has had little opportunity to investigate the value of the various measures. It is a compilation of reference materials which you may find of great value. The April issue of *Electrical Engineering Magazine* contains a summary of the data and tells you where you can obtain any of the reference material involved. It has been reprinted and is available in pamphlet form for your convenience.

Diversified Activities Helped This Contractor

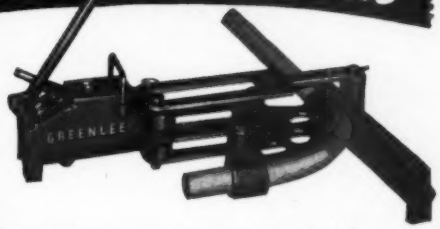
(Continued from page 9)

barracks jobs, as testimonial to how well the work was done. "I've made quite a study of government specifications as they apply to Air Force installations," Mr. Crump pointed out "Their TO's (temporary construction specifications) have been relaxed to go back 25 years in order to let us get the job done with as little strategic material, and that simplifies handling contracts a great deal.

Incidentally, Dixie Electric has gone even farther than the government asks in saving materials. There is the minimum amount of copper and rubber in all jobs, absolutely no steel, and slow burning fibre insulation. Porcelain boxes, fittings, switches and connections are used in every instance. Wires in most buildings are simply cleated along ceilings. Dixie can and does handle some power wiring in conduit, in some hangar installations. At Camp Rucker and Camp Shelby, two large Army camps, his wiring jobs in 400-500 buildings brought a complimentary letter from the Corps of Engineers.

Next to contracting, repair work is leading the field. With a huge shop space available, and ingeniously using scrap materials as far as

EXTRA MANPOWER with GREENLEE BENDERS



Shown above is the Greenlee No. 770 Bender with radius shoe attachment. With one forward stroke of the ram, a smooth, neat-looking, 90° bend is made in a jiffy.

● It's easier to get along short-handed these days if you have tools to eliminate long, tedious hours of hard work. And there's less absenteeism, too, when you have tools that lessen the physical strain on your men. Good tools provide extra manpower—help get more work done—speed up jobs. When you need better tools for essential jobs, investigate the current line of Greenlee Tools. You'll find Greenlee Benders, for instance, will provide extra manpower for all bending jobs, large or small. They are powerful, portable, easy for one man to operate.

There's A Greenlee Bender For Every Job!

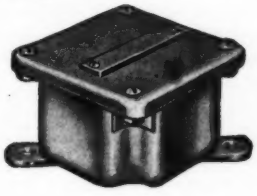
Whatever you have to bend—tubing, E.M.T., heavy-wall conduit, or bus bar—there's a Greenlee Bender, including powerful hydraulic units, that will help ease your manpower problems.

SEND FOR BENDER BOOKLET NO. 5-116

Greenlee TOOL CO.

1768 Columbia Ave. • Rockford, Illinois

Spero *now offers prompt delivery on Navy 9-S Fittings & Fixtures*



The following numbers in the 9-S series of fittings in addition to the basic 3", 4" and 5" boxes, built according to Navy drawings, are now in production, and prompt delivery can be assured. New numbers, not listed here are being added to the line, and information on these will soon be available.

9-S DEVICES AND SWITCHES

9-S Number	Type
4260-L	ES(W.T.)
4262-L	FS(N.W.T.)
4477-L	VIII(W.T.)
4264-L	FS(W.T.)
4563-L	M-N(N.W.T.)

9-S Number	Type
4718-L	CCS(W.T.)
4718-L	DDS(N.W.T.)
4719-L	FFS(W.T.)
4719-L	GGS(N.W.T.)
4720-L	TTS(W.T.)

9-S Number	Type
4721-L	MMS(W.T.)
4816-L	FFF(W.T.)
4816-L	FFF-1(W.T.)
4873-L	GG(W T.)
4914-L	M-IS(W.T.)

9-S Number	Type
4284-L	G-S(W.T.)
4496-L	C-S(W.T.)
4777-L	V-IS(W.T.)
4923-L	IK-S(W.T.)
5174-L	V-S(W.T.)

9-S FIXTURES

9-S Number	Type
4535-L	J-S(White,W.T.)
4535-L	JR-S(Red,W.T.)
4535-L	JG-S(White,W.T.)
4535-L	JRG-S(Red,W.T.)
4536-L	J-S(White,W.T.)
4536-L	JR-S(Red,W.T.)
4537-L	L-S(White,W.T.)
4537-L	LR-S(Red,W.T.)

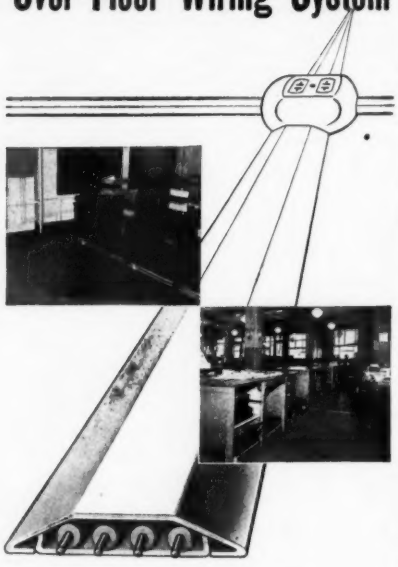
9-S Number	Type
4537-L	LGS-S(White,W.T.)
4537-L	LRGS(Red,W.T.)
5121-L	III-ES(White,W.T.)
5121-L	III-ESR(Red,W.T.)
5122-L	IV-ES(White,W.T.)
5163-L	LL-S(White,N.W.T.)
5163-L	LLR-S(Red,N.W.T.)
5163-L	LLGS(White,N.W.T.)

9-S Number	Type
5163-L	LLRGS-S(Red,N.W.T.)
5173-L	JS-S(White,W.T.)
5173-L	JRS-S(Red,W.T.)
5173-L	JGS(White,W.T.)
5173-L	JRGS(Red,W.T.)
5186-L	LS-S(White,W.T.)
5186-L	LRS-S(Red,W.T.)
5186-L	LGS-S(White,W.T.)
5186-L	LRGS-S(Red,W.T.)

N. Y. OFFICE: 33 West 42nd St., N. Y. C.

THE SPERO ELECTRIC CORPORATION
18222 LANKEN AVE. ★ CLEVELAND, OHIO

PANCAKE WIREMOLD
Over-Floor Wiring System



Safe, Simple, Flexible...
for PLANT or OFFICE

● Pancake Wiremold is the most logical and economical way to take care of extension or relocation of electric wiring to desks, machines, etc., in factory working areas and offices that are "cramped for space".

This safe, simple, easily installed Overfloor Wiring System solves problems of this kind with minimum use of critical materials... without channeling of floors or breaking into plaster of walls... without, in most cases, disturbing people at work. Pancake is neat, unobtrusive in appearance..."flat as a pancake; strong as a bridge"; trip-proof and crush-proof.

Fittings for telephone, light or power service connections and for interconnections to existing wiring or other Wiremold Raceways. Available from stock on suitable priority for essential industry needs. Conforms to Federal Specification W-R-32. Listed by U. L.

Write for detailed new bulletin to The Wiremold Company, Dept. ES-8, Hartford 10, Connecticut.

WIREMOLD

CAN HELP YOU PRODUCE FOR WAR... AND PLAN FOR PEACE!

possible, Dixie Electric has been able to keep the shop busy enough to absorb 10 to 15 men at all times. "We think the job shop is one of our most valuable assets," he said. "Not only as an immediate profit producer, but to keep our men busy. We want to hang on to every employe, and if we can put him in the repair shop between contract jobs, we're sure of having him when we need him."

Five trucks, all rolling repair shops, are kept going at all times, with complete tool and parts inventories. This is ideal for emergency service, Mr. Crump emphasizes. However, parts supplies have been reduced since long trips over bumpy roads are likely to ruin irreplaceable materials. In addition to repairing major appliances, fans and general equipment of the type, the shop specializes in industrial rewiring and repair, and handles heavy electrical equipment short of motor rewinding. This, a business all its own, according to Mr. Crump, is "farmed out" to one of three motor shops in the area. Extensive additions to residential and small-factory buildings are classified as repair work and handled by the shop crew.

"We welcome every sort of small job," Mr. Crump said. "As pointed out before, it gives us that much more work to offer our men. The shop pays overhead and a profit of its own." He has gone after a lot of house-remodelling work (many Montgomery homes in the two-story class have been remodeled to furnish apartments or rooms to the population overflow) but finds this cannot involve much volume because of the $200 improvement limitation on such work. There is no sign work since the neon shop was closed up. Thus, a repair is a double advantage which Mr. Crump realized long ago.

Dixie Electric has won its defense-installation reputation by "humping" on every job. Selective bidding and keeping master contractors familiar with the firm's work gets consideration easily, but nothing but doing the work well in the least amount of time will keep this up, Mr. Crump insisted.

"We work our crews hard because that's what they expect" he grinned "And we finished 500 buildings in 60 days to beat what the contractor asked on the last big job." Men and materials are the two problems here, with materials considerably harder to accumulate than good men. As soon as any electrician is through with a job, he is brought into the shop, and kept busy with an accumulation of repair work piled up in the meantime.

Now that the huge appliance stock has neared its end, Mr. Crump isn't sure that he will re-enter this field after the war. "Department and furniture stores can handle long-term credit on a short profit." he pointed out, "but we cannot tackle the risk and slow returns in combination with contracting business in the future. Discounts, haulage and advertising have all got to come out of a 35% margin on a refrigerator for example, and we've about concluded it's best to stick to straight electrical work." He is also slowly "unloading" lighting fixtures, for which he feels there will be little market after the war. With increased use of plastics, glass and such materials, the old-style unit lighting fixture is "on the way out," he believes. Consequently, the heavy stock is being slowly sold out.

"It doesn't pay to carry anything over for after the war," Mr. Crump outlined, "unless it is wiring or

HEATFLO

the **CHROMALOX**
replacement unit
for all ranges

Flat-top cooking speed
Black heat cooking excellence
Easy cleaning . . . Long life
Favorable deliveries . . . Write.

EDWIN L. WIEGAND CO.
7600 Thomas Blvd. • Pittsburgh, Pa.

ATLANTA, GA.—C. B. Rogers, 1000 Peachtree St. DALLAS, Texas—L. R. Ward, 403 Southland Bldg. Annex. RALEIGH, N. C.—W. R. Phillips.

C. B. ROGERS

ELECTRICAL HEATING ENGINEER
CHROMALOX
ELECTRICAL HEATING UNITS
and
CHROMALOX
EQUIPPED PRODUCTS

1000 PEACHTREE STREET
ATLANTA, GEORGIA

Match the WIRE to the Job . . .

Specify ESSEX
MAGNET WIRE

WIRE
SS
PRODUCTS

Be Sure of These Points

- ✔ Quality of Insulation
- ✔ Ease in Handling
- ✔ Economy
- ✔ Highest Conductivity
- ✔ Adaptability for Winding
- ✔ Resistance to Abrasion
- ✔ Resistance to Chemicals
- ✔ Resistance to Impact

Essex Magnet Wire Manufactured by
ESSEX WIRE CORPORATION
Ft. Wayne, Ind.

Distributed by
INSULATION & WIRES, INC.
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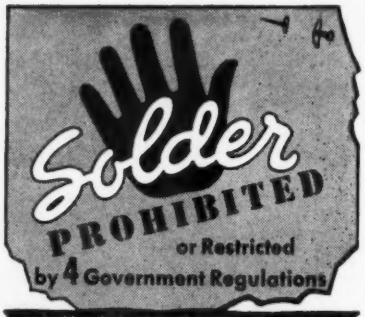

And here's the IDEAL Solution to the Problem!

IDEAL Wire-Nuts

Meet ALL Government Requirements

An ALTERNATE AND IMPROVEMENT for Solder and Tape.

IDEAL "Wire-Nuts" (Solderless, Tapeless, Wire Connectors) contain no copper or copper alloys—no tin, or rubber as used with solder-and-tape joints. Every time you use "Wire-Nuts" you conserve vital materials needed for the War Program. Easy to use; strip wires, screw on, that's all! Make a neater, safer joint; better electrically; stronger mechanically. Fully Approved. Listed by Underwriters' Laboratories, Inc. Sizes for connecting all combinations from two No. 18 to three No. 10, solid or stranded wires. IMMEDIATELY AVAILABLE.

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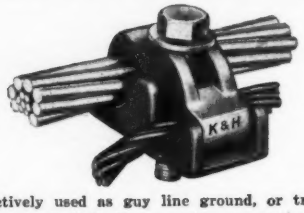
IDEAL Sycamore

• IDEAL COMMUTATOR DRESSER CO •

1017 Park Avenue Sycamore, Illinois

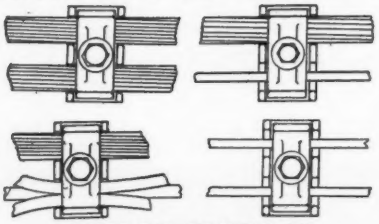
is no better than its

Universal Tap Connector



Effectively used as guy line ground, or transformer and lightning arrester connection to A. C. S. R. or copperweld conductors where the diameters may be from 8-A copperweld to .595" A. C. S. R. armour rods. Wire sizes .595" to 5/32".

ADAPTABLE TO A WIDE RANGE OF USES



WRITE FOR BULLETIN 8-B

K&H KRUEGER & HUDEPOHL

Solderless Terminal Lugs and Connectors

VINE AT THIRD-ES • CINCINNATI, OHIO

electrical materials. For example, I have a basic stock of something like 12,000 outlet boxes, which will always be in demand. I'm hanging on to that carefully, but getting rid of a similar lighting fixture stock. In each case, I'll replace the stock with something else, and continue as much variety as supply conditions will allow."

How to "Up-Rate" Old Transformers

(Continued from page 8)

showed that a winding with 6000 kva capacity could be put into the same space occupied by the old 3000 kva winding. By using new iron, the iron loss was cut from 64.8 kw to 30 kw. This was sufficient reduction to permit increasing the load which could be carried (with both low-voltage windings loaded) to about 14000 kva. This was done without increasing the radiating surface.

The rebuilding was accomplished without any interruption in service. First the spare was rebuilt as described above. The reactance, at the same rating, was made equal to that for the old units; thus the rebuilt unit could be used in combination with the old units. Next, two more transformers were rebuilt (one at a time) and replaced in the bank. The fourth transformer was retained as a spare and was not rebuilt; it can be used and operated at overload in case of a failure on one of the rebuilt units.

This rebuilding program covered quite a period of time. It was started when the ambient temperatures were low; thus the transformers could be overloaded. Portable fans were arranged around each transformer so that in case the temperature went too high, the fans could be used; however, use of the fans proved unnecessary. When fans are not available, a temporary set-up can be made to spray water on the radiators to reduce the temperature during periods of high ambient.

Surge strength must be checked. Cases may arise where it is necessary to improve the surge strength of the transformer in order to insure continuity of service to highly important industrial loads. Transformers over 15 years old may not have surge strengths sufficiently high to permit adequate lightning arrester protection where continuity of service is important.

One company had a failure in one unit of a transformer bank and inspection showed that the transformer was 15 years old. It did not have adequate surge strength to permit it to be coordinated with the lightning arresters which were required for the particular voltage class. An investigation showed that modern insulation could be used in these transformers and that its use would increase their strength well above the flashover of the lightning arresters which were used to protect them. There were three banks of these transformers and they were rebuilt one at a time without any service interruption.

Special iron loss considerations. The iron loss and exciting current may become excessively high on an old transformer if it is operated with higher than normal voltage, impressed to increase the secondary voltage. If the core iron in such a transformer is replaced by the best now available, the voltage can be raised as much as 20 to 30 per cent without increasing the iron loss and exciting current above the normal voltage values for the old iron. In such cases, the copper which is at present more valuable than iron can be saved.

A study of the individual case will suggest the best method of accomplishing the result required. Where an increase in rating is desired, one of the above described means can usually be applied; in many cases, present transformers can be made to carry the increased load, resulting in the saving of much valuable war material.

Salesman Wanted

National electrical manufacturer requires salesman for Atlanta territory to handle motors and transformers. Attractive earning possibilities. Permanent position — not a war engagement. Must have car. Traveling and automobile expenses paid. All replies strictly confidential. For interview, address Box 72, care ELECTRICAL SOUTH, Grant Bldg., Atlanta 3, Ga.

FOR SALE

50 Tons of Used Communication Wire in Good Condition.

E. Levy & Company

Alexandria, 1, La.

Although we profoundly regret the death of our late president

Mr. Alfred L. Eustice

we take pleasure in announcing that the policies and personnel of the organization will be continued as instituted by him, under the able direction of

Mr. John S. Messer
Vice President and General Manager

●

ECONOMY FUSE & MANUFACTURING CO.

Manufacturers of

The Famous "DROP OUT" Renewal Link

ARKLESS CLEARSITE
ECONOMY AND ECO FUSES

1314 RHODES-HAVERTY BLDG.
ATLANTA, GA.

When "KNOW-HOW" is important

let MILLER do it!

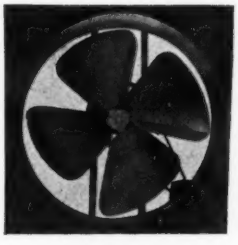
The South's largest general electrical contractor offers you the experience gained from millions of dollars worth of successfully completed contracts for Army, Navy and civilian projects of all kinds including structural work and public utilities distribution systems.

Full equipment and engineering staff available to service any contract, regardless of size.

Miller Electric Company

556 Riverside Ave. Jacksonville, Florida

THE "*Fresh-Air* MAKER"



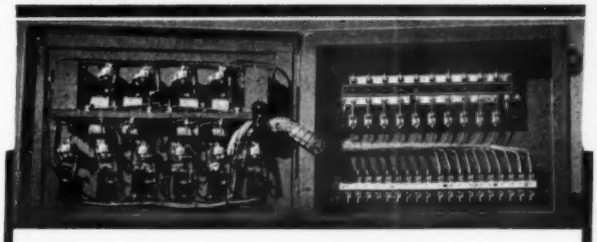
provides fully the comfort and ventilation so essential in army barracks, mess halls, hospitals, headquarters, theaters and other military buildings. Its fine design and sound construction meet the specifications drawn for army fans and it is particularly adaptable to the various types of installations found in army buildings.

HY-DUTY BLOWERS

Single Inlet—Double Inlet. 400 CFM to 12,500 CFM.

Single Inlet Blower illustrated at left is particularly adapted for ventilation of mess halls in military establishments.

BLOWER DIVISION
SCHWITZER-CUMMINS COMPANY
1145 EAST 22ND STREET INDIANAPOLIS, U. S. A.



Marine Electrical Specialties

All types of electrical specialties, boxes, cabinets, control panels, duct-work, etc., manufactured by an organization accustomed to meeting exacting Army and Navy specifications. Full engineering personnel and equipment for manufacture of special electrical items in addition to all standard articles.

Write for information.

Jacksonville Metal Manufacturing Company
JACKSONVILLE, FLORIDA

YOU CAN DEPEND ON

Sepco

1915 - 1943

ELECTRIC WATER HEATERS

ALTHOUGH WAR TIME CONSTRUCTED THEY STILL GIVE THEIR USUAL EFFICIENT, ECONOMICAL PERFORMANCE WITH THEIR LONG LIFE LOW WATTS DENSITY HEATING UNIT, THEIR POSITIVE SNAP ACTION THERMOSTAT AND MOST EFFICIENT HEAT INSULATION MANUFACTURED AND GUARANTEED BY

AUTOMATIC ELECTRIC HEATER CO.

POTTSTOWN, PENNA.

For years, many electrical manufacturers throughout the country have incorporated DOLPH'S Insulating Varnishes into their specifications. They realize it pays to use the best for they know their electrical units are no better than the varnish which protects them.

When in need of insulating varnishes, specify DOLPH'S and assure yourself that your units are getting the proper protection. They are formulated to meet the most rigid specifications.

*(Records on file.)

Dolph's

JOHN C. DOLPH COMPANY

Insulating Varnish Specialists

166 Emmet Street, Newark, New Jersey

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Automatic Electric Heater Co., Inc.

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Briegel Method Tool Co.
Bryant Electric Co.
Bull Dog Electric Products Co.
Burndy Engineering Co., Inc.

C

Crescent Insulated Wire & Cable Co.
Curtis Lighting, Inc.

D

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E

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F

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General Electric Co. (Lamps)
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Graybar Electric Co.
Greenlee Tool Company

H

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Johns - Manville

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Krueger & Hudepohl

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Lloyd Products Co.

M

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Miller Electric Co.
Mitchell Mfg. Co.

N

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O

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P

Penn-Union Electric Corp.
Proctor Electric Co.

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Rogers, C. B.

S

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Westinghouse Electric & Mfg. Co. (Lamps)
Westinghouse Elec. & Mfg. Co. (Motor Contro's) ..... Inside Fror
Wiegand Co., Edwin L.
Wiremold Company

Y

Yongstown Sheet & Tube Co.